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THE RHODESIA RUINS: THEIR PROBABLE ORIGIN AND SIGNIFICANCE.*

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Though the problems of the origin and date of the ruins in Rhodesia had been before the public for about a generation, from the time, in fact, that Mauch rediscovered Zimbabwe, yet up to the present year remarkably little progress had been made towards their solution. In part this was due to the difficulty of exploring a country that has only recently been opened up, in part to the concentration of attention upon a single group out of all the ruins which were available for study, and in part to the want of system with which any investigations had been conducted.

The British Association, when it arranged to visit South Africa in 1905, resolved to make an effort to end this uncertainty, and asked me to precede them by some months in order to explore and to prepare a special report upon the subject of the ruins. Owing to the great improvements effected in the means of communication, and to the exceptional facilities afforded to me, I was able to conduct my researches over a great extent of country, and to obtain observations which have led me to very definite conclusions, which may be briefly summarized in this paper.

It is proper to recall that this was not the first occasion on which the British Association had manifested its interest in this subject, for it was with the aid of a grant from that society that Mr. Theodore Bent, in 1891, made a partial exploration of the site called, *par excellence*, Zimbabwe, as a result of which he published his well-known volume 'The Ruined Cities of Mashonaland.' To Mr. Bent, as his successors must gratefully acknowledge, is due the credit of having awakened the popular interest and enthusiasm; but to him, in great measure, is

* Research Department, February 9, 1906.

also due the responsibility for the unscientific trend which that interest has taken. Before there was sufficient evidence on which to base any suggestions whatsoever as to origin or date, popular opinion settled the question to its own satisfaction, decided that the Rhodesian ruins must be of immense antiquity, and (following the mediæval chroniclers in a genuinely mediæval spirit) pronounced them to be the work either of Solomon and the Queen of Sheba, or at least of some of their Oriental contemporaries. The halo of melodramatic romance, once created, is difficult to dissipate, but I propose to make the effort.

First, to summarize the state of the question as it stood a year ago.

1. Many articles had been found by the several persons who had dug at Zimbabwe and elsewhere, but not a single object had been obtained from the ruins which an archæologist could recognize as more than a few centuries old.

2. There was no authenticated instance of a single inscription having been found in the country.

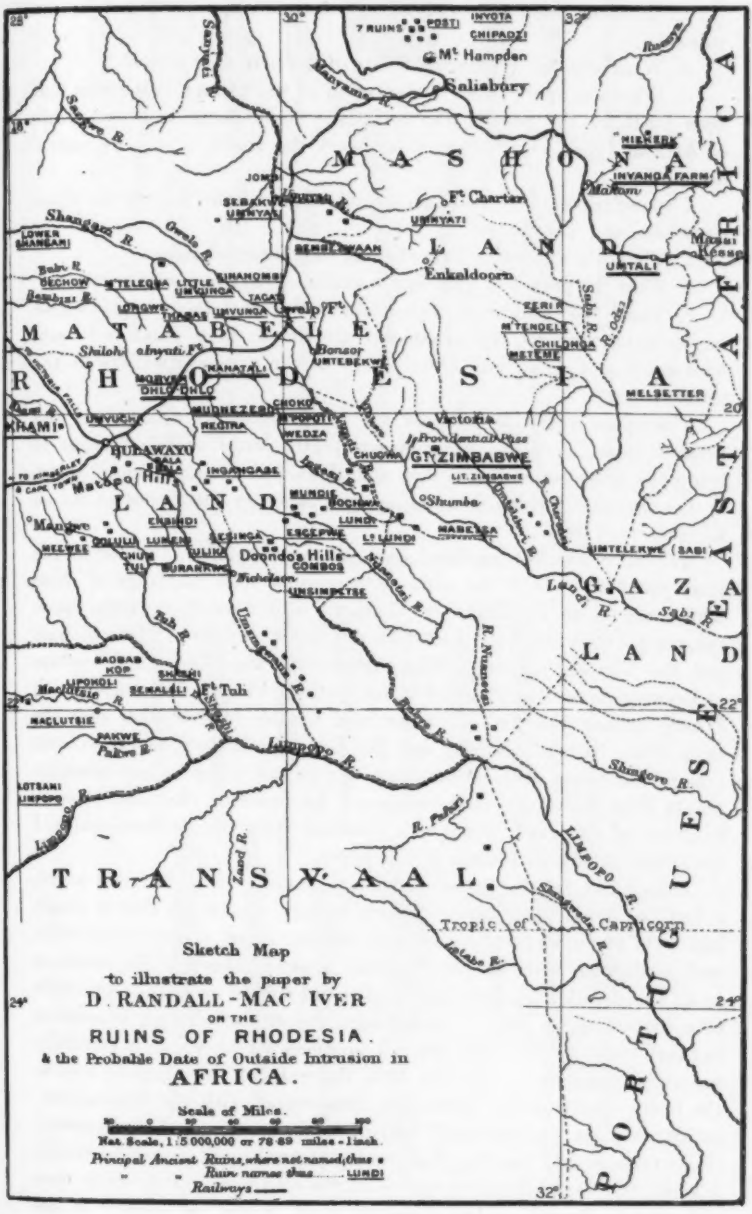
3. On the other hand, the weapons, ornaments, etc., which had been found could be recognized in almost every case as typical products of African peoples; and—

4. Some articles which were not African could no less definitely be recognized as Oriental imports of mediæval date. These were Nanking china, Celadon china, Persian fayence, and Arabic glass.

5. An expert surveyor had shown that the measurements on which Mr. Swan had based his astronomical deductions as to the date of the Great Zimbabwe were entirely erroneous. So that Mr. Swan's work shared the fate of Piazzi Smyth's, which on the face of it always looked probable.

There was, therefore, in spite of the popular opinion to the contrary, no case whatsoever, even a year ago, on which it could be argued that the ruins were of any great antiquity. At the same time, it was generally felt that the observations which had been made were by no means of a satisfactory character. It was possible that the collections which had been made were not representative, and that the foundation-levels had not been properly examined. Underneath the mass of what was undoubtedly mediæval there might exist older strata. The Kaffir things which had been found might not belong to the original inhabitants, but to subsequent settlers. And the latest of the untrained excavators, who had been permitted to carry out excavations at the Great Zimbabwe, asserted this to be the case. He had, indeed, been able to produce no specimens which could prove his assertion that the alleged different levels belonged to widely different periods of time, but it was possible, nevertheless, that the statement might prove to be true.

It was my task, therefore, to carry out such representative excavations as should determine—


7 RUINS
POSTI
INYOTA
CHIPADZI
Mt Hampden
Salisbury
MASHONA
INYANGA FARM
Makoni
Ft Chartar
UMTALI
Enkeldoorn
MATABELE
RHODESIA
Shiloh
Inyati Ft
Bonsor
UMTEBEKWE
MELSETTER
Victoria
GT ZIMBABWE
Shumba
BULAWAYU
Matopo Hills
LANDS
Mangwe
Doondo's Hills
COMBOS
GAZALAND
TRANSVAAL
PORTUGUESE EAST AFRICA
Tropic of Capricorn
Sketch Map
to illustrate the paper by
D. RANDALL-MAC IVER
ON THE
RUINS OF RHODESIA.
& the Probable Date of Outside Intrusion in
AFRICA.
Scale of Miles.
Nat. Scale, 1:5 000,000 or 78·69 miles = 1 inch.
Principal Ancient Ruins, where not named, thus •
" " Ruin names thus ..... LUMBI
Railways

1. Whether more than one period of time was represented in the ruins.

2. What was the approximate date of the period or periods.

3. Whether, apart from the question of chronology, the ruins had been built by the people who left there implements and ornaments of African types, or whether these were the result of a mere casual occupation.

I consider that my excavations have given the answer to these questions, and have proved—

1. That the Rhodesian ruins belong to one period only.

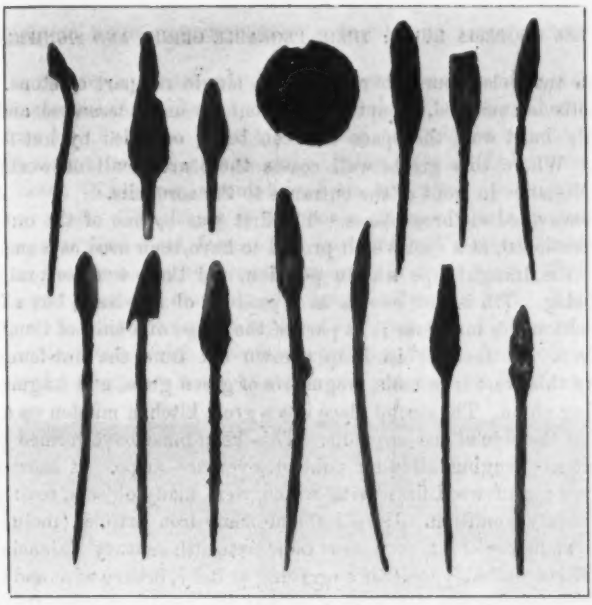
2. That the period in question is mediæval and post-mediæval.

3. That the buildings were constructed by the people whose implements, weapons, and ornaments are found there—that is to say, by a negro or negroid race closely akin to the present dwellers in the country.

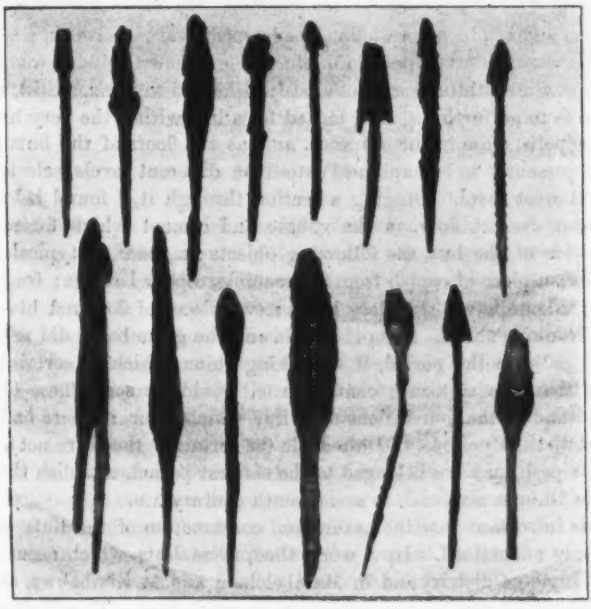
The space available compels me to condense my account on the present occasion within very narrow limits, but I will endeavour to bring the chief points before you, and there will be ample opportunity, in the discussion which is to follow this paper, to cross-question me on all matters of detail.

The sites which I explored were seven in number. Three, in the more northern part of the country, contained rude buildings of stone which are more primitive in character and actually a little more ancient in date than the better-known constructions of Matabeleland and the Victoria district. These three sites are—The Rhodes estate at Inyanga, a remote place 16 miles north of the Rhodes estate which I have named the Niekerk ruins, and Umtali. The other four are Dhlo Dhlo, Nanatali, Khami, and the Great Zimbabwe, which exhibit a more elaborated style of building, but do not differ in any essential points from the more northern sites. As, however, the most decisive evidence of date and origin was obtained from the southern ruins, I shall deal chiefly with them in this paper.

Dhlo Dhlo, in the Insiza district, is a fort—or, to be more exact, a fortified kraal—the plan of which is very similar to that of rough hill forts at Inyanga. The central portion forms a sort of acropolis, well built with slabs of very slightly dressed granite. The walls, as in all these buildings, form, not angles, but curved arcs. The principle of construction, in fact, is everywhere the ellipse, though adaptation to every irregularity of the ground produces a plan which is generally very unsymmetrical. At Dhlo Dhlo the walls of the acropolis rise on the north-west front in three tiers, ornamented with the four characteristic motives of chess-board, herring-bone, chevron, and cord pattern. (Be it remarked, in passing, that these patterns are all characteristically African, and found in every corner of the continent, north, south, east, and west.) Except on the principal front, where the ground is less



DEPOSIT OF IRON WEAPONS AND A COPPER INGOT FOUND BENEATH THE INTACT CEMENT FLOOR OF A PLATFORM IN THE HEART OF THE CITADEL AT DHLO DHLO.



DEPOSIT OF IRON WEAPONS FOUND BENEATH THE INTACT CEMENT FLOOR OF A PLATFORM IN THE HEART OF THE CITADEL AT DHLO DHLO.

broken than elsewhere, there is only a single rampart of stone. The acropolis is encircled, except on the front, by an undecorated and very roughly built wall, the space between being occupied by hut-foundations. Where this girdle wall ceases there are small outworks at a short distance in front of the entrance to the acropolis.

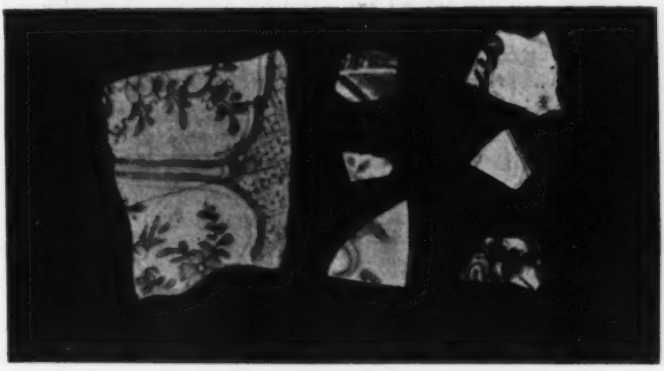
I excavated at three places. The first was by one of the outworks just mentioned, at a spot which proved to have been used as a smelting-place; the draught-pipe was in position, and there were several pieces of tin slag. Tin is not known as a product of Rhodesia, but a Portuguese chronicler mentions it as part of the cargo of a ship of Cambay in 1519 A.D. In the rubbish-heap thrown out from the hut-foundation next to this were iron tools, fragments of green glass, and fragments of Nanking china. The second place was a great kitchen midden on a steep slope on the side of the acropolis. This heap must have formed by the inhabitants flinging all their rubbish over the slope. It consisted of the contents of wood fires, with which were many objects, mostly in a fragmentary condition. Here I found many iron articles (including a pair of manacles of a type figured on a sixteenth-century Valencia tile), stone flakes probably used for engraving pottery, bronze wire and bronze sheathing, copper bangles, cores of copper produced in casting, fragments of bell-metal, beads—some of which were of glaze and porcelain—fragments of Nanking china, etc.

So far the objects found were sufficiently diagnostic, viz. Kaffir weapons and implements, Indian beads, mediæval metalwork, sixteenth or seventeenth century porcelain, etc. The kitchen midden was in the centre of the buildings, and obviously belonged to them. Still, it was advisable to go further. So I looked for a hut within the very heart of the acropolis, close to the entrance, and, as the floors of the huts (for a reason presently to be explained) stood on different levels, selected one on the lowest level. Digging a section through it, I found below the unbroken cement floor, in the rubble and cement which formed the foundation of the hut, the following objects: a sheaf of typical Kaffir assegais; a piece of copper from the crucible, copper bangles; fragments of tin; a spindle-whorl; glaze beads; two pieces of flowered blue-and-white Nanking china. Even if the tin and the glaze beads did not sufficiently indicate the period, the Nanking china, which is certainly not earlier than the sixteenth century A.D., would do so. These objects, being found in the foundations of a hut which, even if there had been several distinct periods at Dhlo Dhlo (as certainly there are not), must from its position have belonged to the earliest period, establish the date of Dhlo Dhlo as sixteenth to seventeenth century A.D.

It is important that the nature and construction of the huts should be clearly understood. In a word, then, these huts, which occur alike in the Inyanga district and in Matabeleland and at Zimbabwe, are the really essential part of the settlement in each case. The stone walls,

which have been so much admired, are merely more or less elaborate ring fences enclosing them. At Dhlo Dhlo, Nanatali, Khami, and Zimbabwe the huts are built of a strong concrete or cement, made probably from powdered granite, very similar to what Lobengula used in his kraal. They are circular in form, and often partitioned into several sections. Thus there is commonly an inner circle, 5 metres in diameter in typical cases, from which partition walls, about 5 metres in length, radiate to meet the circumference of the outer ring. The walls in many cases are still standing to a height of several feet. The floor, like the walls, is of cement, a layer of it being placed upon rubble of stones, a foundation which is strengthened at intervals by wooden posts.

Now, these huts are not confined to one site, but are found in every



NANKING CHINA FOUND AT DHLO DHLO.

The large piece with (blue) flower-pattern was beneath the intact cement floor of a platform in the heart of the citadel.

place which I explored, with the exception of Umtali, where an equally African type (that of stone rings to support wooden posts, which occurs also on the Inyanga sites) replaces them. They are not sporadic, for they are found in every part of an area so immense as that of the Niekerk ruins, where there are over 50 square miles of uninterrupted settlement. They are not subsequent to the stone walls, for they occur not only outside and inside them, but also built into one indivisible mass with them, so that at the Niekerk ruins and Nanatali they present almost the appearance of bastions. At Dhlo Dhlo the whole interior of the Acropolis, and at Zimbabwe the whole interior of all the buildings, have been filled with these constructions of rubble and cement, which fit as closely to the sides of the stone walls as water frozen into a glass. At Zimbabwe the cement is outside as well as inside the stone walls; it forms a bed over the original bottom of rock or sand, a bed in which the stone walls are set like molars in a jaw.

Whatever, therefore, is found *in* or *underneath* the floors of such huts must necessarily be contemporary with the stone building.

At Dhlo Dhlo, as I have remarked in passing, the huts in the Acropolis stood on different levels. This was sometimes due to the prejudice of the old builders in favour of having horizontal floors for their dwellings. The foundation was in any case built up with varying depths of rubble from the uneven ground, but where the bed rock dipped a great deal, it was easier to make separate levels for the floors of adjoining huts than to raise them all to a uniform height. Sometimes, however, there was a real ceremonial reason for the distinction, as appears from a study of Nanatali.

Nanatali, with its monoliths on the wall and its symmetrical plan, is the most attractive of all the buildings which I have seen. It is also one of the most instructive. A study of the ground plan reveals the significant fact that here we have a direct translation into stone of exactly that principle of construction which I have been describing in the cement huts, for the main hut, which occupies the northern half of the enclosure, is connected with the stone girdle wall round it by *stone* partitions radiating out from it like the spokes of a wheel; and when we realize that precisely the same principle of construction is found within the elliptical temple at Zimbabwe, it will be evident that it is unnecessary to fly to the Orient to find analogies for the plan of the latter building.

Again, Nanatali has a no less useful lesson to teach with regard to the levels. In the centre of the northern half of the enclosure is the principal hut. This stands on an artificial platform of cement and stones strengthened by posts, which rises 2½ metres above the surrounding ground; but the other three huts, which the plan shows to be no less integral parts of the whole building, are on a different level, fully 2 metres below the first. From its size, its position, and the fact that it possesses a special entrance of its own, and that all access to it from other sides is barred, it is evident that the main hut was that of the chief. It was, therefore, in deliberate recognition of his dignity that it was erected on a higher plane than the others.

Nanatali was evidently inhabited only for a very short time. I found in one of the huts a large iron nail with screw head, two iron spears, an iron band, and twisted copper; and in a *débris* heap outside one of the entrances, a copper implement and two dakka pipes of soapstone.

Of Khami I need only say, in this place, that the results obtained from it were exactly the same as were obtained from the other ruins. There was not a trace of superposition of periods, and the objects found were just like those found on the other southern sites, viz. Kaffir spears, assegais and axes of iron, soapstone pipes, copper and bronze metalwork, tin, blue-and-white porcelain, and a mediæval iron key.

Next I may treat of Zimbabwe. The "elliptical temple" is a most interesting building, the finest example of its kind, but that kind is only the same that has been noted on other sites in Rhodesia. The "temple" has, in fact, scarcely a feature which cannot be explained on the view that it is a royal kraal, of which the plan is derived from a combination of the Inyanga or Dhlo Dhlo fort with such a building as Nanatali. It is simply more massive, and has no other point of superiority over several of the other ruins. And, without wishing to disparage it, I think it necessary to protest against the highly exaggerated idea of its perfection which is so generally entertained by

NANATALI: FRONT, SHOWING ENTRANCE, STONE RING WALL, AND CEMENT WALLS OF THE CHIEF'S HUT ON A PLATFORM INSIDE.

those who have not seen Zimbabwe. It evinces no knowledge of architecture; only a certain skill in piling up stones. The famous "temple" is inferior to Nanatali in symmetry and beauty.

The first question to be decided was whether there were any traces on the surface of secondary building. As to this, I can say unhesitatingly that the assertion that certain walls have been rebuilt is erroneous, and is due to an imperfect knowledge of the characteristics of the Rhodesian ruins in general, and of the shoddy methods of their builders.

Next, it was necessary to test the assertion that there was a superposition of periods. The last excavator had nearly rendered this impossible by ruthlessly sweeping out of the interior almost everything

that stood above ground down to floor-level. He had, however, left a small corner in enclosure 15, only about 1 metre in diameter, but standing almost to its original height. By a curious piece of good fortune, this was the part of which he had published a section, distinguishing six or seven strata above the level of the floor. It was evident at the first glance that these strata were an illusion; the whole height of the mass (1·9 metre from the floor upwards) was homogeneous cement, and it had been the platform of such a hut as has been described above. The excavator in question states that he destroyed a "modern Makalanga" hut which stood on this patch, and the destruction is unfortunately complete. But in the cement foundation of that hut I found the usual supporting wooden baulks, one of which was over a metre long, and so would have passed through several of the supposed chronological strata. As a matter of fact, this excavator, not understanding how such platforms were made, had mistaken the layers formed by the separate blocks of cement for chronological periods. That there was no difference in character between the contents of the mass at different depths I found by digging. The rubbish thrown in with the cement contained exactly similar articles at all depths; and at 3·3 metres below the level of his "modern" Makalanga hut I found spindle-whorls, coils of copper for bracelets, and pottery, all of just the same kind as occurred on the level of that hut.

This is the lowest spot in the temple; the articles I refer to were found below the level of the foundation walls, and consequently the walls of the "temple" were erected on a higher level than one which contains typical Kaffir products.

Like the other ruins, therefore, the "elliptical temple" was built by Kaffirs, and its date is decided by fragments of china, Nanking ware, and mediæval Arabic glass. The interior was wholly, or almost wholly, occupied at one time by circular platforms of cement of the kind which have been described, but only traces of these now remain.

From the valley ruins I obtained analogous results; there was no superposition of periods anywhere, and off the ground-rock I recovered mediæval Persian fayence, glaze and glass beads, as well as many Kaffir articles.

There can, therefore, be no reasonable doubt as to the date of the elliptical temple and other buildings at Zimbabwe. They are contemporary, to within a century or so, with Dhlo Dhlo, Nanatali, and Khami, not earlier than 1400 or 1500 A.D., and possibly even later.

Simply as an inhabited site, Zimbabwe may have been occupied a little longer, for below the level of the walls I found a thin stratum of ashes containing "Makalanga" objects, 0·8 metre thick, which *might* have been formed by an earlier settlement. This settlement, however,

of which there was no other trace, would not extend the date of its occupation more than a few generations. If such a hypothetical settlement existed, it would have been contemporary with the roughly built ruins of Inyanga and the Niekerk ruins. For that these hill forts, intrenchments, and pit-dwellings date from slightly before the Portuguese period I infer from the absence of imported mediæval articles, as well as from Dos Santos' statement that certain ruins a little north of them near the Zambezi were deserted in his day (Dos Santos wrote in 1609). Inyanga and the Niekerk ruins, however, cannot be *considerably* older than Zimbabwe, as they constitute a series of which Umtali is the most southern link, and at Umtali was discovered a building which possessed the characteristics of the developed Zimbabwe style, as well as a fragment of mediæval ware. Kaffir articles were found in abundance on these northern as well as on the southern sites, there was no superposition of periods, and the details of the building, as well as the objects found, were of native African kind.

Having referred to a Portuguese writer, I will conclude this account by stating that while the Portuguese penetrated so little beyond the Zambezi and the coast that it was not to be expected that they would be able to give any account of the buildings in the interior, yet there are extant two passages which support the inferences that I have drawn from excavations. They state explicitly that the houses of a Monomotapa in 1506 were of "stone and clay" (Alcaçova), and that buildings described as similar to the elliptical temple of Zimbabwe were actually being inhabited by the "captains" of the "king of Benomotapa" in the sixteenth century (De Goes).

If I have spoken very positively upon the antiquity and the origin of the ruins in Rhodesia, it is because I regard these questions as having been decided by the results of my field-work. On the second part of the theme which is to be discussed, viz. the character of the foreign intrusions on the East Coast of Africa and the date to which they should be ascribed, I speak with much more diffidence, since I bring no new or expert knowledge to bear upon it. The authorities are accessible to all, and have been studied by others more closely than by myself. Yet I may venture to draw attention to one or two points. It is not always appreciated that there is little documentary evidence, and there is no archæological evidence extant to prove that the civilized world had any considerable knowledge of, or intercourse with, East Africa prior to the time of Mohammed. The dates of the Arab and Persian settlements, which the Portuguese of the sixteenth century found lining the coast from Cape Delgado to Cape Guardafui, are known from the chronicle of Kilwa. The most ancient is Magadoxo, which was founded not earlier than the tenth century A.D. Sofala itself, as the chronicle states, was first colonized from Magadoxo, and there is, therefore, no justification for ascribing to it an earlier date than the eleventh century

A.D. That in the days of the Roman Empire the Mozambique coast and the Zambezi were beyond the ken of geographers seems apparent both from Ptolemy and from the Periplus of the "Red sea." For the identification of the sites mentioned in these two works, reference may be made to the standard authority of Guillain, who considered Rhapta, the most southern place mentioned, to have been situated on the Rufiji—that is to say, in 8° of S. lat. The documentary evidence, therefore, on the one hand, absolutely forbids us to suppose that Arabs, or any other people known to the ancient geographers, penetrated as far south as Cape Delgado; and, on the other hand, it is too defective to justify the inference frequently drawn from the mere catalogue of place-names, viz. that any considerable trade existed in Græco-Roman times, even with what is now British and German East Africa. Until the spade of the explorer comes to our assistance, we can only safely affirm that these countries were not absolutely unknown at that period. *À fortiori*, if I would suspend judgment with regard to so late a time as that of the Roman Empire, I refuse to discuss anything so shadowy as the possibility of a yet earlier trade with any country further south than Somaliland, the Punt of the Egyptians.

Ethnological data are not in any way inconsistent with this attitude. Granting, what seems to be the case, that the racial type of the peoples at present existing all down the East Coast betrays Semitic *métissage* in varying amounts, yet it cannot be proved that south of the equator the intrusion of this foreign racial element is not comparatively recent.

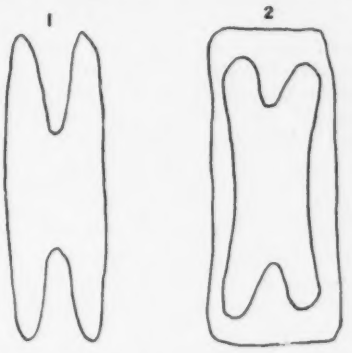
Before the discussion, the Chairman (Sir THOMAS HOLDICH) read the following communications:—

From Dr. ARTHUR EVANS, F.R.S.: My opinion on the question of Zimbabwe can have no special value. I know nothing personally of that part of Africa. On the other hand, I was long ago negatively convinced that the supposed evidence of early contact with Arabia or Phœnicia had no real basis. In fact, it seemed to me that there was nothing in the architecture or the remains discovered in common with either early Arabian or Phœnician models as far as they were known. On the occasion of a lecture by Mr. Hall at Oxford, I pointed out the great presumption that there was that the existing ruins were simply enlarged examples of native kraals. I regard Mr. MacIver's researches as having been carried out by the true scientific method, and, so far as the dating goes, I think that he has made out a satisfactory case for their late mediæval origin. But I have not the local knowledge to express myself in any other than in general terms.

From Prof. J. W. GREGORY, F.R.S.: Looking at the date of the prehistoric mining in Rhodesia from a mining point of view, it is certain that some of the mines were modern, but that others may be of considerable antiquity. It is clear, from their size and extent, that a large amount of gold has been derived from them, and by mining methods unlike those adopted, to my knowledge, by any uninstructed negro people. That the original mining instructors were either Phœnicians or people under Phœnician influence, is supported by the shape of their ingots. They were "astragali," to use the term by which Diodorus described the tin ingots obtained by the Phœnicians from Cornwall. The shape of Cornish

astragali is known from the specimen dredged at the entrance to Falmouth harbour and described by Sir Henry James.* Its form is shown on the accompanying figure, for comparison with the cavity of an ingot-mould found at Zimbabwe and now in the Capetown Museum. For the opportunity of measuring it, I am indebted to Mr. Wm. Sclater.

It seems to me improbable that negroes in East Africa should have stumbled by chance on the same pattern of ingot as those which the Phœnicians used in Cornwall; so that, whoever actually built Zimbabwe, it seems probable that there are traces of Phœnician influence on the early mining industry of Rhodesia. This resemblance has been previously remarked by Bent.



1, TIN INGOT, FALMOUTH.

Dimensions.

Length, 2′ 11″; width, 11″; thickness at the centre, 3″.

2, INGOT MOULD, ZIMBABWE.

Dimensions.

Length of mould, 7″; width, $2\frac{7}{8}$″; thickness, 2″; length of cavity, $5\frac{9}{16}$″ left-hand side; length of cavity, $5\frac{5}{16}$″ right-hand side; maximum width (near ends), $2\frac{1}{4}$″; minimum width (middle), $1\frac{3}{4}$″; maximum depth, $\frac{5}{8}$″. The outer shape of the mould is approximate.

Dr. KEANE: I should like to make a few remarks, first on the very imperfect way in which Mr. MacIver has presented the case, and secondly upon the second part of his theme, which he has scarcely presented at all. I refer, in the first instance, to those objects on which the Semitic school builds its first argument. Such are the conic tower and the other smaller cones, the slate beams, the birds, and the phalli, and other such objects which are not found anywhere else in Africa, which the Africans would be quite incapable of making, and which, on the other hand, point most directly to Semitic worship as known to us from the remains in South Arabia, in Syria, in Sardinia, and elsewhere in the Mediterranean lands. All these objects are passed over in absolute silence, as is also the drainage system, which reminds us much more of the Roman Cloaca Maxima than of any similar structures which have ever been constructed by the aborigines. I come now to the mines, to the gold workings, which are admittedly in intimate association with the monuments above ground, and are fully described by Bent, Maund, and others. Maund refers to the tens of thousands of slaves who must have been at work in the mines, and the millions of tons which must have been overturned in their search for gold, of which some seventy-five million pounds sterling are stated by good judges to have been recovered from these workings. Mr. J. M. Stewart also speaks of the numerous workings which are mentioned in my 'Boer States,' p. 43, and which show that centuries ago mining was practised on a most extensive scale, that vast quantities of ore had been worked, and that by "engineers of a very high order." During his look around, has Mr. MacIver discovered any aborigines who could be described as engineers of a very high order?

On the second part of his theme, the knowledge or ignorance possessed by the

* 'Note on the Block of Tin dredged up in Falmouth Harbour.' Stanford: 1863. 11 pp., 4 pl.

ancients of the southern regions, Mr. MacIver makes the hazardous statement that the ancients, even so late as the Roman Empire, had no knowledge of those parts, and he refers in proof to the Periplus of the Red sea, which in those days meant the Indian ocean. On the Periplus fresh light has recently been thrown by Eduard Glaser, who has discovered that it was composed by a certain Basil of Alexandria, who was evidently much interested in the trade of the Far East. This Basil describes the navigation of the east coast of Africa down, not merely to Cape Rhapta, but all the way to the extremity of the continent. He mentions the island of Menuthias, which must be absolutely identical with Madagascar. There were large rivers teeming with crocodiles, and there were also wickerwork weirs for catching fish, a description which tallies with Madagascar and with no other island on the east coast. He says, further, that the Indian ocean trended round westwards, and eventually mingled with the waters on the other side of Africa—that is, the Atlantic ocean. Now, Basil lived in the time of Nero, consequently it was then known that Africa was an island. But it was also known to be an island long before that period. Herodotus, who is often misquoted on this point, tells us plainly (iv. 42) that King Nechos, about 610, equipped an expedition conducted by Phœnicians, who sailed round Africa in three years and came back by the Pillars of Hercules to Egypt, having started from the head of the Red sea. He says, moreover, that Africa was thus proved to be περίῤῥυτος, which means circumnavigable, all except the isthmus of Suez; and he further adds that Nechos proved this for the first time. What he disbelieves was, not the circumnavigation, but the statement of the circumnavigators, that they had the sun always on their right hand, which, of course, he could not then understand. There is just one other point. I mentioned in the introduction to Mr. Hall's 'Great Zambabwe,' and also in 'The Gold of Ophir,' that the ancients were well acquainted with Madagascar and had continuous intercourse with it at a very remote period, and I am now glad to say that I am supported in this statement by M. Grandidier, who is *facile princeps* in everything connected with the subject of Madagascar. He writes me that he has proof that they were connected with the Comoro islands, and that colonists were sent out, not only from South Arabia, but from Idumea, who settled in those parts. And mention is made by the author of the Periplus of the "Fire men," a most appropriate epithet for the inhabitants of these Comoro islands, where active volcanoes still exist almost in sight of Rhodesia. Therefore, there was no conceivable trouble for the Arabians and the Phœnicians, who had fleets in the Indian ocean, to reach these regions in quest of gold.

Mr. R. N. Hall: Mr. MacIver's paper is noticeable for certain omissions. In the main Mr. MacIver has fixed upon certain ruins, Dhlo Dhlo and Khami, as determining the general character and age of the whole of the ruins in these territories, which groups seven years ago were shown by Mr. Neal, Dr. Schlichter, Mr. Telford Edwards, and myself not to possess any claim to remote antiquity. He gathers the whole of the ruins into one class, notwithstanding that it is admitted by archæological experts, and by architects and practical builders, that there are widely varying styles of architecture, plan, and construction, each type occupying certain defined areas, and each yielding relics only found in such particular type of ruin.

Also, in his description of any one ruin, say Great Zimbabwe, he passes as belonging to one alleged Kafir period, all reconstructions and extensions, as part of the original buildings, notwithstanding such groups—Zimbabwe, in particular—show obviously successive occupations and buildings of several distinct periods. The paper is conspicuous for the omission of references to the numerous and lengthy chains of forts, which, in his block-house system, protect well-defined

routes throughout the country, and also leading towards the coast. It makes no reference to the conical tower and its allied platform and parallel passage, and to the hundreds of phalli found in the older type of ruin, and in such only where the exceptionally well-built, massive curved walls, with mural decoration, surmounted with conical towers or monoliths, or both, are directed towards the east or west. It fails to explain the alleged parallelisms existing between the architecture and construction, plan and mural decoration, of undoubted ancient buildings in South Arabia—Marib, for instance, and those of the oldest type of building in Rhodesia, and of the parallelisms, if not identity, as pointed out by Dr. Keane, existing between the hill terraces of Inyanga and the hill terraces of South Arabia. It is silent as to the undoubted evidences of a certain degree of civilization testified to in skill of building, with elaborate system of drainage and military defence, also in mining and assaying of reefs, and most emphatically and unanimously demonstrated by a very large body of expert opinion as being altogether beyond the capacities of existing Kafir races. Over 450 years ago, De Barros stated that Makalanga, "naked and savage," lived within the Zimbabwe temple, but these were so absolutely ignorant of the origin of the ruins, possessing no tradition concerning them, that they said they were erected by the devil "because they (the ruins) were beyond their powers to execute." The Makalanga of to-day say exactly the same as their ancestors of more than 450 years ago.

The paper, too, ignores the close association found in every single instance of phallus and bird, and the fact that the birds are further associated with conical towers, and that all the birds were discovered occupying an eastward position. Mr. MacIver considers the bird to be but a Kafir tribal totem; but there is no post-mediæval record to this effect, nor any traditions among the natives, with whom tradition dies exceedingly hard. The existence of any tribe with the eagle for its totem is quite possible, for there is not a single specimen in natural history pertaining to South Africa which has not been appropriated for totem by some Kafir race, tribe, sub-tribe, family, or caste.

But surely conical towers, platforms, parallel passages, carved birds, phalli, all found in close association, and never otherwise, point distinctly to some Semitic influence. The architecture, plan, and construction of buildings, the form of religious worship practised at Zimbabwe, and the methods of ancient mining in Rhodesia, and the Semitic impression on the Makalanga, all testify, so the most authoritative experts have always maintained, to Semitic influence in some period of antiquity.

Nor does Mr. MacIver explain why—if, as he alleges, our monuments are of Kafir work—such monuments should be absolutely confined to one area of the country, and why they are not to be found in any other part of Africa south of the equator. Mr. MacIver admits he paid no attention whatever to the ancient gold-mines, yet he practically suggests that the scores of millions of pounds' worth of gold extracted from the rock in the oldest mines was placed on the world's metal market in post-mediæval times. This is a suggestion unwarranted by history, research, and the evidence presented by the mines. The post-mediæval references to the gold export from this country distinctly relate to alluvial, or shed-gold washed from the river-beds. For instance, "the Kafirs from Monomotapa prefer the gold taken from the rivers to that taken from the mines."

The Arabian historians of between 900 and 1150 A.D. speak of the export of gold from Sofala as a long-established and flourishing trade. Fourteen years ago Mr. John Hays Hammond, the well-known gold-mining expert, reported that from the oldest type of gold-mines many scores of millions of pounds' worth of gold had been extracted in some very remote period of antiquity; also, that there had been

successions of gold-mining at different periods. Eight years ago Mr. Telford Edwards made an estimate—and the details of his calculations are published—that at least £75,000,000 worth of gold had been extracted from the reefs in prehistoric times. But fourteen years ago, and even eight years ago, the area of ancient gold-mining was far from being ascertained; the great bulk of the ancient mines were undiscovered, and it is very probable that this estimate was far exceeded.

The late Prof. Sir Le Neve Foster and other mining experts claimed remote antiquity for the older type of mines. They pointed out the skill in mining engineering of the ancients; that they must have been experienced in their art of mining in their homeland; and that there was great similarity between mining in Rhodesia and ancient mining in the Near East. Every mining engineer in Rhodesia has spoken of the skill of the ancient miners as altogether beyond the capacity of any present native race.

I believe the oldest ruins, and the mines particularly, represent the latest phase of a Semitic influence which existed in Rhodesia far back in remote times, possibly before the Christian era; and though it must be admitted that there are both ruins and gold-workings in Rhodesia which are only of post-mediæval origin, I am not prepared to accept the theory of the purely Kafir origin of the whole of the monuments and mines in the country until further investigations have been made into the question of the gold-mines.

Sir Harry Johnston: I have never been exactly to the part of Africa where these ruins are situated, but if my opinion is of any value, I should say my own convictions remain relatively unshaken that there was at a period at least as early as the birth of Christ—I believe earlier—an incursion into this country of a Semitic race of teachers. I cannot otherwise explain the gold-mining, the soapstone birds, the phalli, and the several other features in these remains which are so utterly unlike anything that has ever been made by any race of Bantu negroes. Neither is there evidence to show they could have been made by Hottentots. My own belief is that the presence in Africa, south of the Zambezi, of Bantu negroes is a relatively modern phase. The first violent eruption of the Zulus may have driven away the pre-Islamic Arabs, and yet not have completely caused the gold-mining to cease. It is, however, most useful to all of us that Mr. MacIver should have made a searching inquiry and have put before us an alternative view. All his arguments ought to be considered much more carefully than they can on this occasion, and not be hastily rejected. Still, I do not think his having found Nanking pottery in the foundations of one or more of these structures should induce us to give up too readily the belief that at some period of possibly more than two thousand years ago, Arabians, or people from the direction of Arabia, did make their way down the coast of Africa in the search for gold, and that they were in some way answerable for these buildings.

Mr. Selous: As I had travelled and hunted for a number of years in Eastern Mashonaland before the country was opened up by the British South Africa Company, I had seen a number of walled towns and hut foundations made of well-fitted granite bricks, which the natives said had been put together by their ancestors. I did not see the great Zimbabwe until 1890, and, being no expert or archæologist, I do not know how to explain the discovery there of phallic emblems and a soapstone copper mould; but of one thing I am quite sure, and that is, that the building of walled towns and circular buildings, and the extraction of gold from quartz, did not come to a sudden end a long time ago, nor can I see any evidence that a highly cultured civilized people ever lived in that country, who were destroyed by the sudden incursion of a barbarous race.

There is abundant evidence to show that in the countries of Makoni and Umtasa

the ancestors of the present occupants of that part of Mashonaland were living in very well-built walled towns, and Makoni's people still make offerings to-day to the spirit of Chipadzi at a well-built zimbabwe, where he is said to be buried. Makoni is said to be the direct descendant of Chipadzi. In my opinion, it was the Zulu invasions of the early part of the last century which put a stop to the wall-building in Mashonaland, and which gradually drove the Mashonas out of their walled towns to seek refuge on the tops of the hills, and which also put an end to the extraction of gold from quartz. Early in the last century Mashonaland was invaded by a horde of Swazi Zulus, then by the Abagaza, a Zulu tribe under Manikos, and in 1840 by the Matabele, who came from the west. Many old Matabele men to whom I have spoken have told me that when they first invaded Mashonaland they found the natives working for gold in the "amaguti"—that is, in the deep holes, and in 1891 a bark bucket and a bark rope were found at the bottom of a shaft 120 feet deep, between the Umfuli and Umzweswe rivers. This rope and bucket could not have been very old, and lying with them were an ordinary Mashona axe and other implements. Moreover, as late as in 1870 Mr. Thomas Baines found the Mashonas near Lo Magondis still extracting gold from quartz.

In 1882 I examined an old shaft near the Tati river in western Matabeleland, and found the roof in one place supported by seven poles made of mopani wood (the common wood of the country). I examined all these poles very carefully, and found that they all had the bark on them, and had all been chopped with the same small narrow-bladed axes that are used by the natives to-day. Near this old gold-working there used to be a very well-built circular wall, made of fitted granite stones, with a herring-bone pattern on one side of it. I am sure that the gold-working in this district was put a stop to by the Matabele invasion of 1840.

I think, too, there is strong evidence that the natives who lived on the hill behind the Great Zimbabwe and everywhere else in Mashonaland lived in huts built of poles plastered with mud and thatched with dry grass. At the foot of the hill behind Zimbabwe there are two enormous holes in the ground, and these were undoubtedly the places from which the natives dug the clay used by them to plaster their huts and make their pottery, for close to any modern Mashona village, or close to the site of any abandoned town, you will always find a similar though smaller hole for the same purposes. I never myself could see any sign of a highly cultured, civilized race of people having lived at Zimbabwe or anywhere else in Mashonaland. I walked round the top of the wall of the Great Zimbabwe, and found that it varied in breadth from 6 feet to 13 feet, and I believe that the people who built it intended to construct a circular building, but as they only worked by eye without taking any measurements, they made it elliptical. Surely if they had any knowledge of a written character, they would have had inscriptions on the soapstone pillars embedded in the walls of the fortress on the hill above the Great Zimbabwe, but there were nothing but herring-bone and lozenge-shaped ornamentations. I examined these, and nothing could have been more rude; there was not a single straight line in them. Any native could cut such patterns in wood or soft stone at the present time. Given a powerful chief in Mashonaland a hundred years ago, at a time when the natives were still accustomed to building walls of well-fitted granite stones, and I see no reason why such a chief could not have had such a building as the Great Zimbabwe put up.

Mr. C. H. Read: My contribution to this discussion will be a very short one, seeing that I have not seen these ruins myself, but I have only seen, during recent years, sundry of the remains that have been dug from them. Some years ago Colonel Rhodes brought me divers objects which had been found under similar conditions to those described by Mr. MacIver. But with regard to these, I may say

nothing that was brought to me differed from what might have been made either by the existing or recently existing natives, except in cases where they were importations of a well-known date. That is to say, there was Arab pottery and Chinese porcelain, such as Mr. MacIver has found, but nothing dating from an earlier period than about the thirteenth century. Now, we know that Mr. MacIver has made systematic excavations on, I think I may say, sound archæological lines. We have, therefore, relics which can be readily dated within a century, or even closer, no one of which (the imported articles) can be placed to a more remote date than, say, the thirteenth or twelfth century. The point before us is, are the ruins B.C., or do they belong to mediæval times? That is why there is no particular reason to bind one's self to the thirteenth century when it might be the fourteenth. With regard to one of the pieces of inscribed pottery shown on the screen, the writing upon it was dated, from the character of the script, as being about the fifteenth century. The character of the ware, however, would lead me to place it somewhat earlier, perhaps the thirteenth. They are the oldest importations to which any date can be given at all. All the Chinese porcelain is of a later date, it may be of the fifteenth or sixteenth century. Therefore we have these importations of a known date. As to the native objects, the assegais and so on, there is no need for me to speak about them here, because there are many gentlemen who know them far better than I do; but so far as I can see, there is nothing that might not well have belonged to the recent predecessors of an existing race in that part of Africa. Now we have these imported objects, which are more easily dated than native articles. We have them found in a definite position with regard to the construction of these ruins. As the foundations were made first, and these are part of the foundations, the superstructures, as Mr. Selous pointed out, must necessarily be subsequent to the date of the objects found in the foundations. That is really the kernel of the whole situation; that is the positive evidence. Now for the negative evidence. I have never heard of any series of ruins, spread over a wide extent of country like this, and assumed to have been erected by a civilized race, who have not left one single relic of any kind that is comparable with, let us say, the civilization of the Mediterranean area, or what is known of Arabia. There is not, so far as I have ever heard, one single object that can be set down as belonging to any civilization of any of these northern people at a period, say, before Christ. That is the negative evidence, and, taking the two together, one cannot set down these ruins as being erected by any civilized race from the north or at a period antecedent to the Christian era.

Mr. H. Balfour: I do not think that I can add materially to this interesting discussion. My own opportunities for visiting the sites of the ruins in Rhodesia were very few. I was able to pay a brief visit to Khami, and I made a three-day stay at Umtali, spent principally at the ruins with Mr. Andrews. In comparing these two sites, I could not but be struck by their individuality, as exhibited both in their general characteristics and in certain points of detail. The presence, for example, at the Umtali ruins of numerous curiously engraved and otherwise decorated stones of large size, and the numerous finds of steatite figurines, furnish a striking feature which is not paralleled at other similar sites. The abundance of rude flint flakes and implements at some of the ruins, associated with the iron tools of native manufacture, and their scarcity on other sites, is another feature worthy of further investigation. I have recently (in *Man*, February, 1906) suggested an explanation for this, but further work is required. Although the various sites bear undoubtedly striking resemblances to one another, showing their certain relationship, yet the divergences are equally important, and I gather, from the descriptions of Mr. MacIver and others, that this individuality extends more or

less over the range of the ruins. It is evident to me that it is of the greatest importance that renewed investigations should be undertaken, and that each individual site should be worked out as thoroughly as possible, before final generalizations are made upon the whole group.

Personally I sympathize strongly with Mr. MacIver's conclusions, and I consider that the results which he has arrived at by unbiassed archæological methods are conclusive as far as they go; but I still hold that there are yet important details requiring explanation, and on these grounds I think that it is extremely desirable that further work of a highly organized kind should be instituted. What we seem to require now is an organization somewhat similar to that of the Egypt Exploration Fund, which would enable the work to be conducted under the supervision of a highly qualified organizer, and to proceed during a period of years, until a sufficient amount of evidence has been obtained. The problem is none the less interesting for having been to some extent transferred from archæology to ethnology, and it remains just as worthy of detailed investigation as before.

Dr. Haddon: Mr. MacIver has not had time this evening to give us all the data he has collected. In Bulawayo he informed us he had seen a large number of buildings in which he could trace the gradual evolution of such a complicated building as that of Zimbabwe from a simple kraal. It seems to me that the whole of the evidence of the ruins should be considered, as all the remains are associated; it is unfortunate that Mr. MacIver's time was too short to enable him to study the gold-workings and what has been described as a chain of forts, but as his opportunity was limited, he wisely confined himself to the more important buildings. I heartily agree with Mr. Balfour that a society or association should be formed to examine the problem thoroughly in all its aspects. With regard to the phallic emblems obtained from the old ruins, I may state that I saw in a Makalanga hut a couple of clay breasts on the interior of the wall, showing that a magical practice connected with reproduction is carried on at the present day. There is one question which perhaps Mr. Selous could answer. It is whether any local Bantu chief, or king, ever had sufficient power to organize labour of this kind? I am perfectly aware a chief could organize warfare—fighting is a game most men like; but is it likely he could enforce the tremendous amount of hard work that was necessary to exploit the gold-mines?

Mr. Selous: Any Zulu chief could have commanded 10,000 men.

Dr. Haddon: And make them work in the mines?

Mr. Selous: Oh yes.

Dr. Haddon: That seems to me an important point, because some one, a Makalanga or other chief, must have had a considerable amount of power to do this, as well as to build the forts and keep open the trade routes.

Mr. D. G. Hogarth: I quite agree with Mr. Read, who is really the only speaker, so far, who has addressed himself to the subject from an archæological point of view. The most important point in Mr. MacIver's paper, from an archæologist's point of view, is the section which he cut at Zimbabwe. Mr. Hall said nothing about it. I should be glad if Mr. MacIver, in his reply, would be very precise and tell us whether it is certain that he actually found pottery under foundations, or whether he found it where these had been removed.

Mr. MacIver: Absolutely certain.

Mr. Hogarth: That is what I want to know, because on this pottery depends a very great deal. I would remind the meeting that if that lowest building in the elliptical "temple" goes, the elliptical "temple" goes with it, and the bottom is knocked out of the Semitic theory. It is on the elliptical temple that the whole Semitic theory centres. It rests also on a great deal of vague generalization. As

Mr. Read says, we have no other evidence of Arabians or Semites here, and it is not conceivable that these would have left no positive evidence of their presence. For instance, there is not a scrap of their writing. And there is another fact which I wished to mention at the Geographical Society some time ago, and that is this: A great deal has been said about South Arabian buildings in this connection, in spite of the fact that we practically know nothing about them. We have never had any published photographs of the Marib ruins. They were not even seen by Dr. D. H. Müller, who has been quoted by Mr. Hall. He endeavoured to get there some years ago, but the party quarrelled, and he barely escaped with his life down to the coast. These buildings may or may not have an analogy with those Zimbabwe buildings, but in quoting them we have been dealing with an unknown factor all the way through. My own view about this problem, if it is worth anything, has been pretty definite for some years. I was not convinced by Mr. Bent's evidence. I was always very much impressed by two facts: one that no real evidence of high civilization was offered, either by the architecture, or still more by the smaller finds, particularly those much-vaunted steatite phalli and birds. Of course, steatite is the easiest stone that is worked by man, and the work that was done in this at Zimbabwe was far below the present work of the inhabitants of New Guinea. I hope that the result of this meeting will be that more attention will be paid to definite archæological evidence such as can be gained by scientific investigations; such evidence as I think, to a great extent—though I agree that the whole area has not been covered—has been gained by Mr. MacIver; and less attention be paid to assumptions in this matter. If you will read Mr. Bent's book and other works upon this question with care, you will see that the sanctity of the elliptical temple was always assumed at the start, and practically almost everything—every generalization which has been drawn about the things found in that curious and irregular area, rested upon this assumption. If I may add one other thing, I would ask Mr. MacIver, in his reply, to say whether he has any theory about the erect monoliths. I admit they may signify almost anything, but it is possible he may have formed some definite theory as to the purpose for which they were put there.

Mr. J. L. Myres: There is one point which I perhaps misunderstood, and I should be very glad if Mr. MacIver in his reply would make it clear. He gives us in his paper evidence that the cement platforms come right up to the inside of the big walls of Zimbabwe and of these other buildings, and he mentions instances in which they come right up to the outside. The only weak point which I think the critic might conceivably find in that proof is as to the exact relations between the walls and their immediate foundations. Does one get anything to suggest that the earliest platforms inside and outside the wall really go back to the period of the walls themselves? He makes use of the analogy of water frozen into a glass or the molars in a jaw, but that does not prove anything about the relative age of the water and of the glass; so I am not quite clear that his proof of the age and composition of the cement deposits is complete.

Mr. L. Doncaster: I have no justification for addressing the meeting, except that I was at Zimbabwe after Mr. MacIver was there. I am not an archæologist, but it did not seem to me to be certain that Mr. MacIver had got to the foundation of the outside walls at Zimbabwe. It seemed to me that the proof he gives that the structures inside the walls of Zimbabwe are comparatively modern need not necessarily apply to the walls themselves. I saw and examined the trench of which he gave a photograph. There is no doubt it goes under a small very badly built wall, and underneath that wall there is clay with ashes and pieces of charcoal, and teeth of oxen very well preserved and obviously fairly new. But it did not go under——

Mr. MacIver: Do you mean below the level, or do you mean passed underneath?

Mr. Doncaster: Below the level; so far as I could see, the foundation was nowhere exposed.

Mr. MacIver: I must correct you. That trench went underneath no wall; it was in Section 15, and ran north and south.

Mr. Doncaster: There was a little wall.

Mr. MacIver: Yes, but my trench did not run under that. I merely dug there to see what it was. It did not run underneath; it started at that point.

Mr. Doncaster: Yes, so that you can see the wall was built upon clay containing bones and teeth.

Mr. MacIver: The statement will pass.

Mr. Doncaster: It was not near the great wall outside. I saw no evidence that Mr. MacIver had exposed the foundations of the main wall.

The Chairman: If no one else wishes to make any remarks, I will ask Mr. MacIver to reply shortly to the questions which have been raised.

Mr. Randall MacIver: The ground covered, of course, has been exceedingly wide, and it has been a very great relief to me to find in the last three speeches that one seemed at last to be getting to grips. I had wished from the start to have this discussion closer, and to be able to answer every objector one by one. As it is, we have acquired a great deal of useful information, but several of the speeches, much as I have learned from some of them, have shown a totally false conception of what is the logic of these things. It is, as Mr. Hogarth put it—and he has virtually answered the most important of my objectors—entirely an archæological question. I had hoped to be cross-examined about the sections and about my field work, and not to be assailed with vague generalizations about what might conceivably have happened under certain geographical conditions. I answered Mr. Hogarth, interpolating in his speech, that the decisive objects were found directly underneath the foundation of the huts, and not merely below their level. Mr. Myres' point is a valuable one. I am quite certain that the cement platforms belong to the walls. I used the analogy of water frozen into a glass, and that applies to a place like Dhlo Dhlo or Nanatali. The fitting is so exact that the cement must actually have been made to go into the stone. At Zimbabwe are still better examples, because there the cement goes outside as well as under the walls. Mr. Doncaster, of course, gets on to the same point: Had I got to the bottom of the walls? Yes, the section which I particularly referred to in the elliptical temple, the section in enclosure 15, was in the very lowest corner of the temple, and when I got down to bed-rock I could not get to anything else, and I was several feet below the main walls there.

Taking my other objectors one by one, Prof. Gregory refers to the ingots. Well, that is a very small point. If Prof. Gregory knew his Portuguese authors, he would find there is a reference to natives making ingots in the form of a cross. As a matter of fact, this shape of ingot is found in various parts of the world, and has no doubt been adopted on account of its convenience for tying into loads. Prof. Keane maintains that the conical tower, the birds, and the phalli are not African, but Semitic. Mr. Hogarth has dealt with the matter of the birds; they are of extremely rough work. The suggestion that they have any Egyptian character is simply ludicrous. As to "phallic worship," authors have spoken exceedingly loosely about it, and have never defined what it means. If there is to be any sense in terms, you cannot describe as "phallic worship" anything in which an anthropomorphic deity is concerned. But it is to be observed that in any case the rites which most nearly approach to anything like phallic worship are found amongst *native African* peoples, viz. the Ewe-speaking tribes of the West

Coast. In which connection I may remark that the famous "zodiac" belongs to a class well known from the West Coast, and the bells found by Mr. Hall at Zimbabwe suggest the same provenance. Prof. Keane, when he mentions misquotations and misunderstandings, reminds me there is both a misquotation and a misunderstanding in his interesting book on the 'Gold of Ophir.' The reference is on p. 162. Referring to Bent's statement that he had found a bowl inscribed with certain characters, Prof. Keane reproduces five characters, and from the terms in which he writes, leaves the readers to suppose they were inscribed on Bent's bowl. But they are the letters of the proto-Arabian alphabet, and taken from the alphabet, and not from Bent's bowl. I would not have referred to it, but the misconception has found its way into other books, and this sort of evidence ought to be checked. There are seven mentions of ruins in the Portuguese chronicles. The Portuguese did not get very far into the country, and you can work out exactly how far they did get in. I have been through all the Portuguese chroniclers very carefully; they are to be found in Dr. Theal's 'Records of South-Eastern Africa.' There are two references to Zimbabwe, and it has apparently been overlooked that one of them settles absolutely that the buildings were inhabited in the sixteenth century, when the author wrote. The writer is De Goes, and the reference may be found in Theal, vol. 3, p. 109: "In other districts of the said plain there are other fortresses built in the same manner, in all of which the king has captains." The "king," as appears from the context, is the "king of Benomotapa." This is in agreement with what Mr. Selous was telling us. I have been taken severely to task for not dealing with the mines. I had not the slightest intention of doing so, because I knew that I could not obtain sufficient archæological evidence from them. But there is a great deal on the subject to be found in the Portuguese writers, and it is of some interest. I have put together, in my report, some notes as to the actual output of gold. Of course it is exceedingly difficult to get any exact estimate of what has been extracted. Let us, for the sake of argument, take the suggestion which puts it at 75,000,000. A Portuguese writer (Alcaçova) states the yearly sum being taken out at the very beginning of the sixteenth century. Translated into English money, it was somewhere between £109,000 and £140,000 sterling. It would not take many centuries to run up even to such a figure as 75,000,000 at that rate. I think I have nothing further to add, except to say that of course this is not a full account that I have been able to put before you. I have done my best to bring a good deal of evidence before you in a short space of time, and I am exceedingly obliged to those gentlemen who have been so kind as to support my opinion, and not less obliged to those who, by opposing me, have brought fresh light to bear upon the subject.

The CHAIRMAN (Sir THOMAS HOLDICH): I can only express my regret that for a discussion so interesting as this has been we had not a little more time. I think it might well have been extended over two meetings. I think the general sense of the meeting appears to be in support of Mr. MacIver's contention, but there have been such divergences of opinion expressed that I quite agree with what Mr. Balfour has said on the subject of further investigations on the lines he suggested. I can only say for myself that if ever such investigations can be carried out, I hope they may be collated with other investigations on the further side of Arabia, where there are, extending along the coast from Beluchistan to the Puráli river, which in the time of Herodotus was called Arabis, a great number of ruins still awaiting research by the archæologist, which I believe are due to the building capacity of the Himyaritic Arabs. At the present we have nothing more to do than to thank Mr. MacIver for giving us a most interesting address leading to a discussion which I think will be productive of further interest in the future.

Colonel H. W. Feilden, who was unable to attend, sends the following remarks on Mr. MacIver's paper: My personal acquaintance with the ruins of Rhodesia is confined to those of Khami, near Bulawayo. I visited them last year. These buildings do not seem to me beyond the intelligence of native African tribes to construct. At the same time, is it not hazardous to deny that those who built these "cities" were not influenced by an ingraft of a higher civilization from without? Do we not possibly underrate the traffics and discoveries of the ancients, and the influence they may have exerted by contact with the barbarous inhabitants of South Africa? But my object in joining in this discussion is to draw attention to facts which seem to have been overlooked, or touched on very lightly. The enormous *débris* mounds, covering many acres, surrounding the ruins of Khami, have been raised by a people largely using stone. Implements of stone, such as flakes and cores, are to be met with in thousands; in fact, hardly a stone I picked up, even on the surface of the *débris* mounds, failed to show the handiwork of man. This suggests that the inhabitants of Khami could not have been in a very forward condition of civilization.

I do not suggest that the presence of a partially stone-using population necessarily entails remoteness in time for the building of Khami. I find without doubt that a stone-using people of Bushman-Hottentot character lived on the shores of Table bay and False bay at the time of the first occupation by the Dutch. In their kitchen middens, relics of European wares are mixed with the stone implements of the chase and of their daily use. These stone implements are Neolithic in type; so are those at Khami. There is a Palæolithic and Neolithic period observable in the Stone Age of South Africa. I am not prepared as yet to draw a line of demarcation between these periods; probably they inosculate. A great lapse of time must have elapsed between the Palæolithic race, which has left abundant traces of its workmanship in the high-level river gravels of the Zambezi valley, deposited before the Victoria falls and the chasms of that river were carved out, and the builders of Khami. I have ventured to draw attention to the stone-using character of the people who raised the *débris* mounds of Khami, in the hope that the future explorers of the ruins of Rhodesia may pay greater attention than has hitherto been done to this interesting and perhaps elucidating subject.

ANTHROPOGEOGRAPHICAL INVESTIGATIONS IN BRITISH NEW GUINEA.*

By C. G. SELIGMANN, M.B., M.R.C.P., and W. MERSH STRONG, M.A., M.D.

From the Alcesters we sailed to Murua, where at Bonagai there are some hundreds of feet of coral rock. Beneath this in places is a bluish rock. From this rock, when it has become altered and softened often

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* Continued from p. 242. After the first part of this paper had appeared in print, I received a note from Dr. Strong, in which he states that—

(1) The mountains called the Tully peaks in his map of the Mekeo and Inauvorene districts (published in the March number of the *Journal*) are probably incorrectly named.

(2) On comparing the barometer used on his trip with the boiling-point thermometer, the former was found to be much in error, so that all heights are incorrect.—C. G. S.

to about the consistency of mud, gold is obtained. Some 7 miles from Wanai bay, where we anchored, proceeding towards Mapas island, the hills tumbling to the shore consist of several hundred feet of a bluish dolomitic limestone, fretted everywhere into pinnacles, and carrying only a flora of scrub and small trees. This was the site of a number of not very recent cliff burials, and we found a large number of bones, often placed in pots deposited in the shallow caves and limestone fissures. A few of the bones were painted red, and one skull had a pair of turtle-shell earrings slipped on to its zygomata.

Mapas island, over which towers Suloga peak, lies some 7 miles to the east of that site of these cliff-burials, and here, in the position

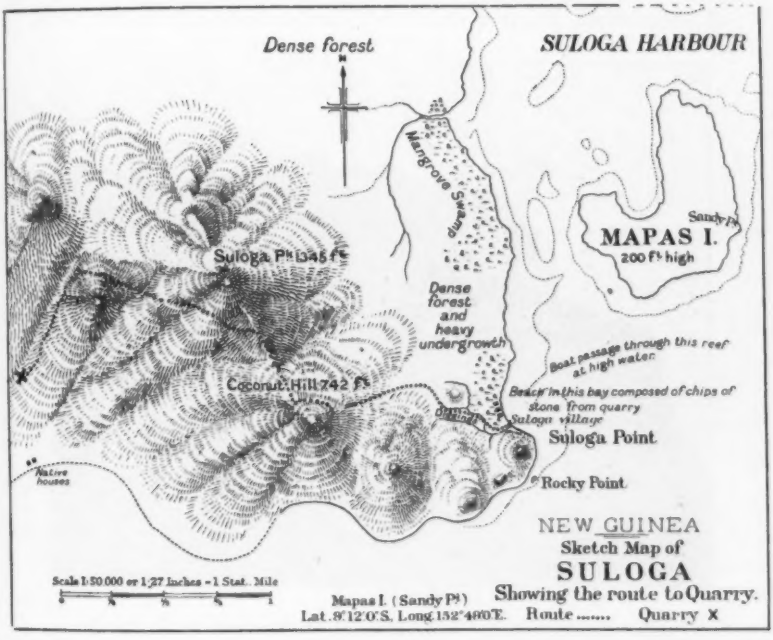
SULOGA VILLAGE. BEACH COMPOSED ALMOST ENTIRELY OF FLAKES.

indicated on the sketch, we come upon a portion of the sand beach covered inches thick with flakes and chips, a residue which only generations of stone-working could have produced. Here we made our camp, beside the two-house hamlet which is all that now remains of the two formerly prosperous and popular Suloga villages. Inquiries showed that the quarry lay somewhere on the seaward flank of Suloga hill, though it was by no means easy to find an adequate guide.

On leaving the beach the track led across half a mile of flat land, behind the mangrove belt, only a little elevated above the sea-level, thickly bushed, and with some great gaping red wounds where alluvial gold-mining was being carried on in the iron-impregnated soil. "Float"

and doubtful outcrops of a stone closely resembling the common implement material were plentiful as we climbed. The rise was sharp and fairly even till, after a stiff scramble, the crest of Coconut hill (Wanakwaiin of the natives) was reached. This is a continuation of Suloga peak. Here, at an elevation of about 700 feet, was a natural clearing, one of those curious places, common in New Guinea, where trees do not grow, and from it Suloga harbour and the coast to the eastward lay map-wise below us.

This open space was some acres in extent and marshy, with plenty of chips lying about, and two remarkable standing stones of which we could



get no explanation. The bush on the opposite sides of this open space was, in the childhood of men now old, occupied by two large villages—Wandari to the north, and Maied to the south—whose folk in the old times had been the custodians of the "quarry," and through whose hands its output passed. They chipped stones into rough shape, and bartered these (for there was a large trade in the unfinished article), or wrought them to laborious perfection on grindstones of granitic-looking rock, which we found lying along the track near their former dwelling-places. The largest are great blocks, some well over a hundredweight, with deep saucer-shaped depressions where the grinding

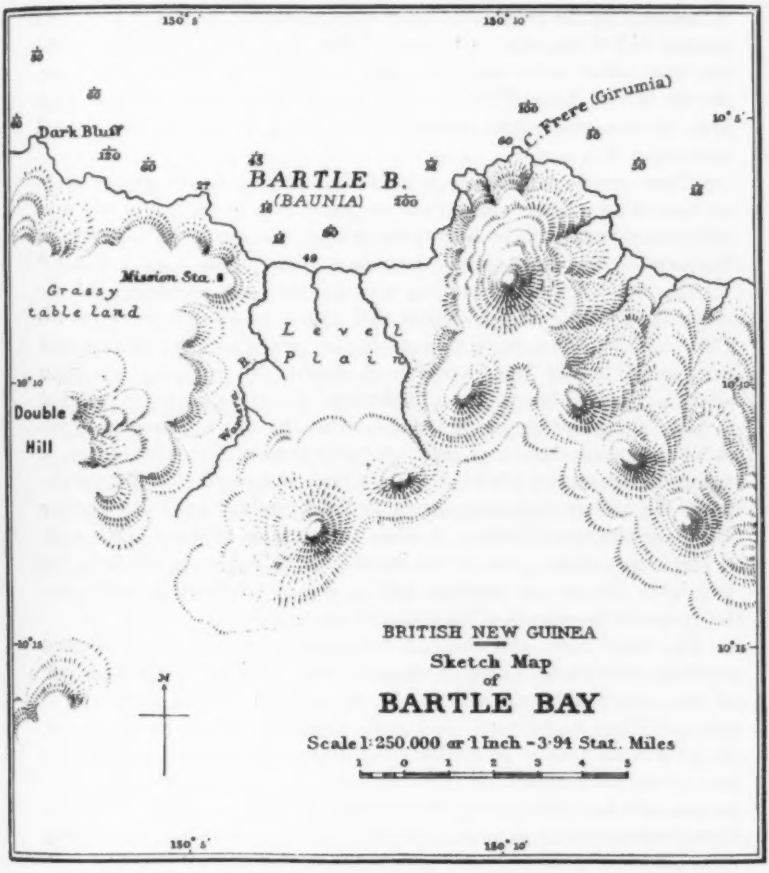
had worn them down. The whole hill is deserted now, and the old village sites thickly covered with young jungle. About thirty years ago an epidemic swept the villages nearly clean, and with the dead died the art of making stone implements. The few survivors fled to the present two-house beach village of Suloga, or, by one account, went first to the other side of the bay, and later came back to their present position.

From the natural clearing on Coconut hill we walked north along the crest of the ridge through a few hundred yards of second-growth bush, where lay the old site of Maied village. Here stone chips were plentiful, and among them many stone implements in the earlier stages of manufacture, together with a few further advanced, but we found

A PORTION OF THE OLD REEF FACE EXPOSED ON THE HILLSIDE TO THE WEST OF BARTLE BAY.

no finished or nearly finished tools or benam. Beyond was another strip of open country, rising sharply to the crest of Suloga peak, which is itself covered with heavy bush. This open space was sparsely grassed, the soil being a red sandy clay, above which protruded many detached boulders and what appeared to be true outcrops of rock apparently identical with the material from which stone implements were commonly made. Flakes lay everywhere, literally acres of flakes; not scattered specimens, but in compact sheets having a thickness measurable at least in inches—plain evidence of a vast amount of work extending over a considerable period of time.

Soon we bore to the left, plunging into the thick bush of the peak's western face, and following a most fallible native guide, who led us far and near over ledges of volcanic rock and tumbled boulders, till at last, after a long rugged traverse of the mountain's flank, we came to the place of our desire. The steep slope breaks away suddenly in a half-circle 100 yards wide and perhaps 30 yards deep, down whose



nearly perpendicular sides we scrambled to a creek-bed all boulders and ledges of tool stone, and showing frequently the curious narrow streaks and bands of lighter-coloured material which, running lengthwise of its blade, give the perfect benam its last attribute of value and beauty in the natives' eyes.

No doubt stone was taken everywhere from along this creek; but

we had to follow its course down to an elevation of probably not more than 250 to 300 feet above the sea, and scarcely half a mile inland, before the traditionally most important place was reached. Here the little stream raced for more than a hundred yards in a trough formed by two remarkable rock masses. A smooth table of tool stone quite 25 feet wide was canted downhill at an angle of about 15°, and also tilted to the left at an angle of 25° from the horizontal. Its upper edge is bordered by the jungle; its lower edge meets and fuses with a straight smooth cliff of the same rock, some 18 feet high, with a slightly undercut base which rises nearly at right angles to the table-shaped stone. At the foot of this cliff for its whole length runs a series of bands, some very narrow and others several inches wide, of the lighter-coloured material.

There was no evidence anywhere of quarrying in the proper sense of that word. The descriptions we were able to gather of old-time methods of work gave no hint of anything of the sort; and the extreme hardness of the stone makes the idea at least *prima facié* unlikely.* Furthermore, no real quarrying was in the least necessary, for the creek's bed just above the ledge is still full of broken pieces of beautifully marked stone, quite manageable in size, which the natives said used to be broken into workable fragments by dropping one upon another from as high as a man might lift. A further supply of material is found along the creek's right bank, where, butting on the edge of the table rock, are a number of rather compact masses of smaller stones, so curiously shaped and placed that for a time it seemed that they might be, as the natives said, implements in their very earliest state together with large flakes and cores. A closer examination of these heaps made it plain that, while a few of the surface stones might be artifacts, the bulk were the natural product, still *in situ*, of weathering, or of some fairly recent movement of the hillside's upper *débris*.

The table rock, and the cliff bounding it on the left, both end suddenly in a terraced drop of some 50 feet; after which the character of the valley, and especially of the sections cut by the stream, is so changed that a different geological formation seems to intervene. There was not time to go further down-stream than the lip of this fall; and it was while returning from examining it, and at a place where the surface soil had fallen away, that a mass of stones was seen similar to those butting on the table rock higher up, but in this case presenting clear evidence of having been produced *in situ* by natural causes.

The day after visiting the quarry was spent in collecting such information as is now obtainable about the disused quarry and the lost

* Sir William MacGregor, who visited the quarry, states, "They [the natives] break out stone, and it is said also split up the rock, by fire" ('British New Guinea and its People,' p. 12. London: 1897).

art of stone-working. The first breaking of the stone seems to have been a very chance affair, when pieces already broken by natural causes to some nearly suitable shape were not found ready to hand. The ultimate shape of the implement, whether it was to be adze, chisel, or benam, though it depended greatly on the workman's skill in cleaving, was undoubtedly assisted by the careful selection of a not too unkindly fragment to work upon. It is evident from this how it was that really choice benam, properly broad and thin and well marked, got part of their value from rarity of material—that is, from the scarcity of suitably shaped rough stones. For to make a benam from even the most promising bit of material must have required great perseverance and labour, while to have made one from a frankly unsympathetic beginning would be an appalling task even for Papuan patience and skill. The actual flaking is alleged to have been done with spherical water-worn stones about from 2 to 3 inches in diameter. These are found near Suloga, in what from the description one would guess was an old river-bed, and each consists, according to Mr. Fearnsides, of the core of a spheroid of gabroid dolomite.

Free flaking was the method by which implements were roughed out, the flakes occasionally being of such size and shape as to make a useful adze-blade when one edge was ground. After the tool had been carefully roughed out came the grinding, which at Murua was done on flat slabs of a granite-like rock found plentifully about Suloga and elsewhere in Murua. A slab of suitable size and shape was brought to the village from wherever it might be found, but no quarrying or serious trimming was attempted, and it was a case of finding the proper thing ready-made. Sand and water were used for all grinding, but the very last—the polishing—was done with water alone, the powder worn from the two stones then forming the "tooth."

Of ancient grindstones we found some dozen in all, but without making any determined search; some on or near the sites of the two former hill villages, some on the beach where the present Suloga village occupies ground on which a much larger settlement once existed. The depressions worn into all these grindstones were circular, going to show (as tradition also asserted) that the grinding motion was round and round rather than back and forth. Many unground stones were exported, notably to the Marshall Bennet and Trobriand groups, perhaps also to the D'Entrecasteaux and Louisiades. These would then be polished locally by their new owners, who, however, failed to obtain the beautiful even polish present on the best Murua-ground stones.

Dr. Marr and Mr. Fearnsides have examined a number of flakes and rough and polished adzes derived from Murua and the Marshall Bennet group, as well as a number of adze-heads collected in the Central Division and traditionally derived from further east. The stone implements obtained at Murua fall geologically into two series—

(1) Those composed of an ash often banded, and always more or less silicified.

(2) Those composed of lava showing well-marked flow structure (rhyolite), and containing inclusions, the latter giving rise to the lighter bands.

To the first division belong a number of flakes found at Wanai bay, at a spot locally known as "Red-bluff," as well as rough unground adze-blades picked up at different spots on the track leading towards Suloga peak from Coconut hill. An unpolished adze-head collected at Gawa also consists of silicified ash. To the second class belong a roughly flaked adze collected on the track to the peak, as well as flakes picked up on the grassy area below the peak and other flakes collected on Suloga beach, as do a series of Murua-made adze-blades obtained at Iwa.

It thus seems clear that two geologically distinct kinds of rock were worked at Murua, one being a volcanic ash, the other a lava. These might be expected to occur close together, or even to form superposed strata. Both rocks may be, and at times actually are, banded, and, both being hard, we did not, until this was pointed out by Dr. Marr, appreciate that there were at Murua two quite distinct kinds of rock from which adzes were made. Hence nothing can be said as to whether the natives had a preference for either kind of stone; but, judging from the adze-heads collected, the broadest and most even bands undoubtedly occur in the rhyolite, which would thus have come to be especially valued.

In old times Murua-made implements were common over a very large territory, being traded from tribe to tribe on the north-east coast of the mainland to Collingwood bay at least, and on the south-west certainly as far as the Papuan gulf, and quite possibly even beyond.* The introduction of iron, or rather its coming into general use, would necessarily put an end to the making of stone implements for actual work, but the ending, it would be expected, would be a gradual one. Yet the Suloga people, by their own account, suddenly stopped making adzes for both practical and ceremonial use. Said an old man, "My grandfather was a famous maker of stones, who taught his son, my father, whom as a small child I often saw at the work. Undoubtedly he would have taught me as I grew up, but for the big sickness. He died, and I was never taught, nor were any of my generation." And even if a synchrony of introduced iron and a devastating epidemic killed at a single blow the

* For the northern and western extension to Collingwood bay of the province of the Suloga adze, I am indebted to the kindness of Mr. A. M. Campbell, resident magistrate of the Eastern Division, who gave the expedition a beautifully banded adze-blade of Suloga rhyolite collected in Collingwood bay. With regard to the Papuan gulf, Dr. Marr, who has examined a small adze-head I obtained at Jokea, considers this to be composed of a silicified ash identical with that of which many of the Suloga adze-blades consist.

art of making stones for use, there remains the problem of the implements not for use—the "ceremonial" benam, to give them the name by which they are known at Tubetube. These Murua-made benam had a range which spread through the south-eastern archipelagos, and extended in an easterly direction on the southern coast at least as far as Mullins harbour.

With armshells, benam which, though less than half an inch thick and exquisitely polished, might exceed 13 inches in length and 5 inches in breadth, formed the high denomination currency of the south-eastern archipelagos. Their provenance, so far as we know, was Murua only, with Suloga as the principal and perhaps only quarry, and also the chief factory for turning out the finished product. Iron, as already pointed out, may be supposed to have quickly destroyed the value of stone tools, and so killed, in perhaps a very short time, the art of making them; but benam still retain their ceremonial use, while their value, either as ornament or as currency, has certainly not diminished. They are worth more to-day than ever, and it is a mystery why their manufacture was abandoned as suddenly as appears unquestionably the case. The mere devastation by disease of the old Suloga villages is not enough to account for the sudden permanent cessation of benam-making by the survivors; since it appeared that benam were formerly made elsewhere on Murua, and perhaps even in other places among the islands from Murua stone imported in the rough. Grinding and polishing shell is still common enough everywhere throughout South-Eastern British New Guinea; but in this district the art of flaking, grinding, and polishing stone is extinct, and as loss and breakage and occasional export (but only very occasional now) make them rarer and rarer, the value of benam is rapidly increasing. The trader finds it worth while to pay from £5 to £10 in cash or in trade goods for a really good example, when he can secure one. He is sure to sell it again for a handsome profit in the course of his wanderings, taking in exchange copra, tortoise-shell, and other native produce, supposing he does not find it better worth while keeping for the prestige its mere possession brings.

Westwards and somewhat to the north of Murua lie the Marshall Bennet islands, Gawa, Kwaiawata, Dugumenu, and Iwa (Jouveney island). West of these, and distant but 9 miles from the Trobriands, is Kitava (Jurien island).

Dugumenu is described as a "low coral island about half a mile in diameter, covered by trees and cocoanuts." We did not visit it, as we were told at Gawa that it held no permanent population, but was rather of the nature of a coconut plantation for Gawa and Kwaiawata. The other islands of the group are all elevated atolls whose population live in hamlets in the central depression of the old lagoon bed, and there make their gardens out of sight of the sea, and marvellously sheltered

from storms. On Gawa the villages in the old lagoon bed were some 60 feet below the uppermost edge of the encircling coral wall.

The edge of the reef at Iwa has been elevated to a height of about 350 feet at the south-east extremity of the island. In the case of Gawa and Kwaiawata, the reef is about 100 feet higher than this. Only the northern end of Kitava was examined, and here the reef rose to a height of about 300 feet. On examining the sections constructed by Captain Pim, it is clear that all the islands are more or less terraced. This did not appear to us to be entirely or almost entirely due to weathering, but rather to indicate successive periods of uplift. On Iwa the terracing was particularly marked, and the ascent easy after a short almost vertical portion of the cliff face above the beach had been ascended. All these islands, then, show a marked likeness to each other, and differ only in detail, so that a good general idea of the group can be obtained by carefully considering one island. To this end, Captain Pim's account of Kwaiawata is quoted at length.

"This island is small, roughly circular, its greatest diameter being about a mile. In places it is very steep to, but a fringing reef lies off the south-east and north-west sides, and a belt of gradually shoaling sand just outside the reef affords convenient anchorage. On the east and west points of the island the cliffs come right down to the water, and there are numerous small caves to be seen along these parts of the coast; apparently some of these caves are used by fishing parties to sleep in, as mats, etc., were found in them, and places where fires had been made and food cooked were seen. The beach is composed of coral cement, with loose coral boulders scattered about, and is about 6 or 7 feet above high-water mark.

"Starting from the beach on the east side, a gentle slope leads up to the first ridge (about 20 feet above sea-level), which appears to be an old sea-beach; a slight depression follows; and then, climbing up a sharp rise, the first platform, about 100 feet above the sea-level, is reached.

"This platform, a large portion of which is covered with heavy scrub timber, leads up to the foot of a wall-like cliff, only to be scaled by ladders made and placed in position by the natives.

"The top of the cliff is 240 feet high, and a winding path, running along the edge for some distance, leads to the crest of the old reef, 415 feet above sea-level. This is by no means the highest point of this side of the island, but rather bore the appearance of being, in the days when the surface of the reef was awash, a deep-water entrance into the lagoon.

"Numerous coral patches lay scattered about, and rose much higher than the place where we were standing when the reading of the barometer was taken. I should consider they were quite 30 to 40 feet above our level, and it was strange to see how well the coral had stood

the destructive influence of the elements. I, who had passed most of my life among coral reefs, could almost fancy I was walking on one of the Queensland Barrier reefs as I looked round upon the boulders scattered about.

"From this spot we could see the floor of the old lagoon, which dipped towards the centre, giving a view of extensive gardens, with here and there a group of coconut and betel-nut palm towering above the low undergrowth, and drawing attention to the little brown houses of the native villages, whose sites they marked, and around which they were clustered.

"The parts of the central depression not under cultivation are covered with a thick, heavy, second growth of young timber and ferns, in striking contrast to the higher, larger-girthed trees of the circumferential rim.

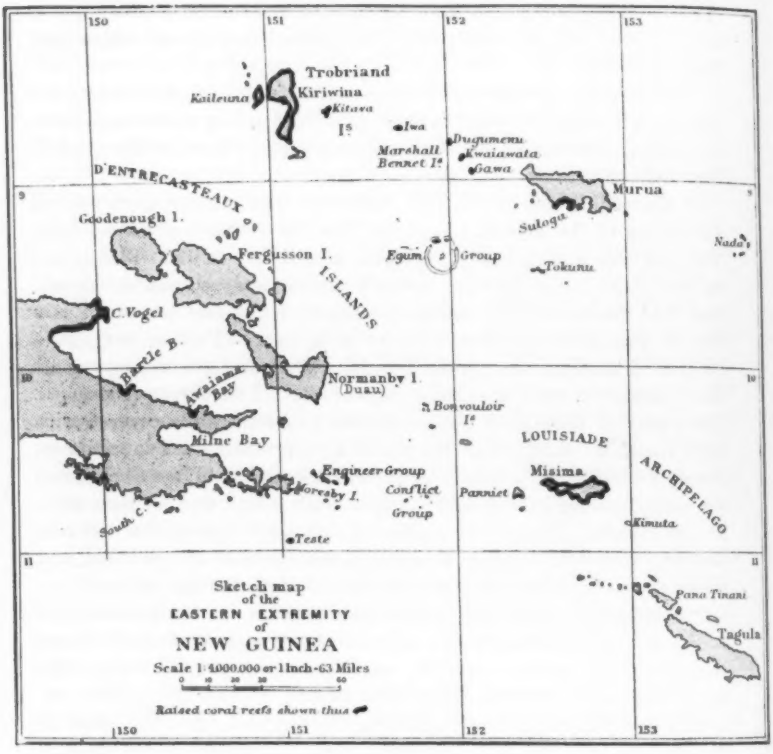
"Descending the slope, past numerous garden fences, we reached the centre of the lagoon, and found it to be 325 feet above sea-level. The soil was a rich, heavy vegetable mould, and in the villages and on the paths it was trodden into a compact mass as hard as cement, that held the water, and became so slippery with every shower of rain that it was positively dangerous to walk upon. Passing through a number of hamlets, the ground became higher and the coral boulders more numerous, until the inner edge of the old breaker was reached. The path led through a gully between two coral walls covered with high trees, and emerged at the top of a cliff which went down almost perpendicularly. The barometer showed the height to be 440 feet, and we were standing in a crevice between walls which were at least 20 or 30 feet higher. The crevice continued down the face of the cliff in a slanting direction, forming a chimney, down which the path led, and which the natives said was the only way to reach the flat below.

"Scrambling down the cliff, towards which it was necessary to keep one's face, shifting hands and feet slowly and carefully from one projecting coral point to another, was tedious and painful work. The projecting points of coral were worn smooth by the native feet constantly passing over them; a passing shower had made the coral as slippery as ice, and the occasional pools of water in the central depression of the island had not improved our boots for this kind of work, where to slip meant a fall of some hundreds of feet.

"About halfway down a slight projection afforded a much-needed rest, and we were met here by a group of native women, who were carrying up great bundles of coconuts, firewood, and food from their gardens below. Everything was carried up on the head, and it was wonderful to see the dexterity shown in balancing the load as they climbed up the steep track.

"A reading of the barometer gave the height here as 280 feet, and I am rather inclined to think at some time or other this was the water-

line of the reef, the coral above this line being most distinctly more weathered than that below it. Continuing the descent, the bottom of the cliff was found to be 90 feet above sea-level, and this also seemed to have been a water-level at some time. From the foot of the cliff a gentle slope, covered with cultivation patches and thick scrub, fell away towards the water. A few small huts were seen on the edge of the



scrub, which we were told were used as living-houses by people working in the gardens, or building and repairing canoes on the beach. About 200 yards or so from the foot of the cliff a raised beach, of large water-worn coral boulders and a small quantity of sand, was crossed; it was about 5 feet higher than the land between it and the cliff, and a barometer-reading made the height above sea-level 60 feet.

"The land—upon which were growing some very large trees and thick undergrowth—from the raised beach to sea-level did not appear to be cultivated, and was thickly strewn with broken coral and large

boulders, not so much vegetable mould being present among them as was the case nearer the foot of the cliff. The height of the tops of the trees on the highest part of the island, worked out by sextant angles from Gawa, gave the highest point as 520 feet above sea-level."

Kaileuna and Kirwina in the Trobriands are coral islands. Although both are for the most part low, the latter presents well-marked coral cliffs at its northern extremity. Beyond these to the west stretch a number of reefs and coral islands, the extent of which has not yet been accurately determined. Nada and Egum groups are atolls on which are a number of coral islands. In the centre of Egum atoll is the

IRRIGATION AQUEDUCT, BARTLE BAY PLAIN.

island from which the group takes its name. At the northern extremity of Egum Sir George Ruthven le Hunte describes a rocky prominence "composed of bare rock with its strata lying at a vertical angle . . . and traversed by a broad vein of pink rock." *

No raised coral reefs have as yet been reported on the D'Entrecasteaux archipelago, though these have been noted by Mr. Gibb Maitland in the Louisiades at Misima, Panaet, Wari, and Kimuta (about 10 miles east of Misima). On the mainland, the same authority notes raised reefs at Awaima, Bartle bay, and Cape Vogel; while on the south-eastern coast there is a raised reef on Einauro island, about 2 miles

* Annual Report, 1900–1901, p. 17.

from Milport harbour. The distribution of the raised coral reefs just mentioned, and those previously referred to, are indicated in the sketch-map by dark areas or thickened outlines of the islands in which they occur. It will be seen that they indicate that a very large portion of British New Guinea has been uplifted.

The usual height above the present sea-level of the raised reefs in and around the south-eastern extremity of New Guinea varies from a few to 500 feet, but Mr. Gibb Maitland mentions a coralline limestone, called by the natives "korada," which forms a prominent object in the landscape at a height of 2000 feet up the mountain-side above Awaiama. He could detect no fossils in this. As regards the date of the uplift corals collected by Major Daniels from raised reefs at Bartle bay, which he estimated to be between 300 and 400 feet above sea-level, are stated by Dr. Marr to be late Tertiary or recent, as are those collected at Tohunu. The idea of recent movement is supported by the geology of Bartle bay. On page 351 is a rough sketch-map of the small area immediately surrounding the bay studied by Major Daniels, from whose manuscript the following notes are taken almost as they stand.

The country surrounding Bartle bay is, generally speaking, hilly and broken, without any striking preponderant mountains, hills, or valleys. The bay itself is a shallow indentation in the south coast of Goodenough bay, of roughly crescentic shape; the distance from horn to horn of the crescent being about 5 miles, and the general direction of a line joining the two being east and west. At the eastern extremity of the bay a hog-back hill rises abruptly from the sea to an estimated height of some 500 feet, and runs nearly south for 2 miles, then trending westward until, about $3\frac{1}{2}$ miles from the coast in a direct line, it becomes broken, and ends rather suddenly at a point a little east of a north-and-south line drawn through the centre of the bay. Around the south-western foot of the Hogback a stream—the East river—debouches from the mountainous country inland on to the flat we call the Plain. Across this it takes a somewhat sinuous northward course to find the sea a little east of the bay's centre.

The sea-floor along the whole coast of the bay is extremely steep to, with no bottom in 30 fathoms half a cable length off shore. This beach itself is composed of water-worn pebbles. Behind this, except at the bay's extreme western limit, lies a remarkably level plain, which has already been alluded to as the Plain. For the most part the Plain joins the beach at the latter's horizon; but where the Plain's inequalities raise it above beach-level, the junction takes the form of low bluffs whose maximum height is never more than 12 feet. Here and there along the bay's coast, but always at some distance from the mouths of the East and Wamera rivers, a certain amount of coral is growing in the form of very narrow fringe reefs.

The eastern, and to a certain extent the south-eastern, boundary of

the plain is the Hogback, which everywhere rises sharply from nearly level ground. On its extreme north-west the Plain ceases abruptly at the most eastern of a series of flat-topped plateaux, called in this paper the Terraces. These rise one after another, sometimes with slight intervening depressions towards the south-east, till they meet a range of broken hills which we call the Western hills, which have an estimated maximum height of 1000 feet. The Terraces abut on the sea for about a mile, their slopes being so steep as to be nearly true cliffs, faced with a narrow beach. Beyond the Terraces' most western extension, the Western hills occupy the coast-line till the western limit of the bay is reached. The eastern boundary of the Terraces (where they abut on the Plain) is of very irregular outline, and their southern limit does not reach more than 1½ to 2 miles from the coast in a north-and-south line, the western boundary of the Plain being taken up, after the Terraces cease, by a southerly and easterly extension of the Western hills. These hills then push south-east along the Plain's edge till, at a point a little west of the bay's centre and about 3 miles from the coast in a north-and-south line, they swing more to the east, and move in that direction to the south-western end of the Hogback. The Plain, bounded as above described, is roughly triangular in shape, with the curved line of the bay's coast for its base.

Besides the East river already mentioned, a second stream, the Wamera, debouches on to the Plain through the Western hills a little south of the southern limit of the Terraces, and, after skirting their eastern flank for a short distance, pursues a north-easterly course of considerable sinuosity, to find the sea about half a mile east of the most eastern terrace.

The Anglican mission station is located on the high ground in the angle formed by the eastern and coastal boundaries of the most eastern terrace.

The Plain.—The Plain is both remarkably flat and level. The soil, usually very free from gravel and stones, is of considerable depth nearly everywhere; and, under an admirable system of irrigation, yields excellent crops of sugar-cane, taro, etc. Below the soil, judging from such scant sections as the Wamera and East rivers have cut in the course of their passages, lie what appeared to be very definite layers of gravel or of sand, or of both mixed, sprinkled sometimes with rocks and even boulders, and with often a considerable proportion of mud, although there were found no distinct argillaceous strata.

After their debouchment on to the Plain, both the Wamera and East rivers occupy well-defined if shallow flood plains of considerable width.

The Terraces.—These formations, of which no visible counterpart exists along the eastern and southern boundaries of the Plain, rise for the most part very suddenly and steeply from the level ground, and with an even sweep except where the Wamera river or some gully

has cut deeply into their sides. Their tops are remarkably level and even, and though the differences in horizon between the highest and lowest are not great, there is a steady upward progression of elevations from north-east to south-west. Where the Terraces abut on the sea, their slopes are even steeper than on the sides of the Plain, and gullies and slides are more frequent; while on the west they break away sharply and irregularly to a deep gulch, dry most of the year, which separates them on that side from the broken country of the Western hills. For the most part each succeeding terrace rises directly from the next lower in point of horizon; but where the width of the formation is considerably reduced by irregularities of outline, there is sometimes a shallow depression separating terrace from terrace.

The most south-western terrace, the highest in point of elevation, and estimated to reach a height of 150 to 200 feet, abuts, without any intervening depression, on a spur of the Western hills, which here become the western boundary of the Plain.

The Terraces are naturally treeless; the soil is thin and poor, very stony, and even rocky, and increasingly so as the junction with the Western hills is approached. Boulders are present here and there on the surfaces of the different Terraces.

Considerable opportunity is afforded in various places for viewing the internal structure of the Terraces, which would everywhere appear to be the same. The formation is completely stratified from top to bottom, the strata seldom more than 2 feet thick, and often not more than a few inches; the materials varying from stones and even boulders, nearly all much worn and rounded, down to gravel and fine sand, but without anywhere presenting any marked amount of strictly argillaceous matter. The strata are sometimes entirely, or almost entirely, composed of one or another material, but more frequently are much mixed; and none of them containing the coarser materials are sufficiently compacted to be called "stone," though some of the homogeneous strata of the finer materials appear as soft sandstone at all horizons from the top to the bottom of the different Terraces.

The strata of which the Terraces are composed present the greatest disorder in the horizontal sequence of the different materials of which they are constituted, but wherever seen and at whatever horizon, they all dipped with great regularity to the north and north-east, and always at an angle which did not vary much from 30°.

It has already been stated that the Terraces abut on hills, which reach an elevation of about 1000 feet, and which we call the Western hills. As far as our inspection went, no stratified material was found on these hills above the level of the highest terrace, the range being composed of country rock, which Dr. Marr states is obviously volcanic and probably basalt.

The position of the raised coral reefs may now be stated. There is

an ill-defined path leading over the Terraces from the mission station into the Western hills, and on through them to the villages on the coast of Goodenough bay to the westward. Immediately after leaving the level of the last terrace for the first slope of the hills, this path skirts a collection of coral masses. Below these masses, and on the terrace itself, are two or three coral boulders, evidently fallen from above, and below these coral fragments strew the terrace slope for many yards. Even the larger masses of coral are not now *in situ* at the (present) horizon of their original growth; for elsewhere on the Western hills, both east and west of this point, long lines of coral can be seen at higher levels, which are constant enough to give ground for a presumption that the coral so appearing has not been much moved since the general uplift its presence above sea-level establishes. Near the masses of coral just mentioned, but slightly up the hillside and a little south, great solid sections of old reef-face have slid bodily down without breaking or overending. Behind and above these lies the old reef-surface, covered with a thin layer of finely broken country rock so decomposed as to bear the usual scanty herbage. Above this, again, but only after a wide stretch of pure country rock, the old reef-surface begins once more, naked and marvellously like, for all its weathering, the surface of a living fringe reef from which the tide has fallen. Just above this, *i.e.* at an estimated height of 350 to 400 feet above sea-level, the level is reached (approximately) of the highest line of coral seen, and above this nothing but country rock was to be found.

Such is the present condition of the uplifted coral at the only point which press of other work permitted to be closely examined; at a point where—and the locality was chosen partly because this fact could be plainly established with the binoculars from the mission station—it has suffered the greatest displacement from its original position relative to the hillside. But it was impossible at this point (or elsewhere from such observations as could be made with the binoculars) to establish the vertical depth of the original growth of the reef with any accuracy, though it seems certain that this depth could not have been more than 40 or less than 30 feet.

The coral *in situ*, or nearly *in situ*, on the west side of the Plain is limited to the Western hills, lying west of the Wamera, and is not even visibly continuous on them at all points where it might be expected to appear. And although it was most carefully searched for, no trace of coral in any position or condition was found or seen (*a*) on the Western hills lying between the Wamera and the East river, (*b*) on the Terraces (with the exception of the fragments already alluded to), (*c*) on the Plain, or (*d*) in the beds of either the Wamera or the East river at any point of their course which came under our observation.

East of the Plain the coral appears here and there (but not con-

tinuously to the eye) on the Hogback, at what must be very nearly the same horizon occupied by the coral *in situ* on the Western hills.

The foregoing account of the geomorphological features of Bartle bay has been given at some length, since it seems to bear on the age of the present coastal zone, and to suggest that the existence of Bartle bay in anything approaching its present form is a comparatively recent event. Dr. Marr, who has read through Major Daniels' notes on Bartle bay, and examined the photographs with which they are illustrated, suggests that the history of the coastal zone at this point is somewhat as follows: There was first a period of subsidence; when this occurred or how long it lasted is quite uncertain, but if the deposition of the reef rocks now upraised marked the closing stage of this depression, this stage was geologically recent, and probably there was no long period before elevation began. When elevation did take place, the coral reefs which had grown during the period of submersion on the flanks of the mountains were lifted to varying heights in different localities not very far apart. The movement was, in fact, in part differential. Further, it may well have occurred in stages. The evidence in favour of this point of view derived from the coral terraces of the Marshall Bennet group and the signs of surf action high up the cliff at Tokunu seems strengthened by the irregular nature of the stratification (current bedding) of the Bartle bay plain and the occurrence of the Terraces. The latter, Dr. Marr suggests, are the remains of old flood plains.

The fertility of the Bartle bay plain has already been alluded to. Roughly, three-quarters of its area is under cultivation at one time or another, and that portion is carefully irrigated from which a crop is to be taken. The southern portion of the Plain—the apex of the triangle—is irrigated from the East river. The intake of the main canal is about a quarter of a mile in a direct line from the nearest of the gardens, but, by reason of the lay of the land, the canal has to travel a good mile around the spurs of three hills, and across a gully (dry except at the height of the rains) some 70 feet wide by 40 deep, before it reaches the first lateral ditch. For this latter purpose an aqueduct of three hollowed logs is used. These are supported by both banks of the gully and two sets of uprights, each log so placed that it slightly underlaps the next preceding and is enough below it to make the path of the water a series of tiny cascades.

The northern portion of the plain is irrigated from the Wamera river, the intake of the canal being located a little below the point of the river's debouchment on to the plain. The canal in this case follows an uneventful course, without hills to circumvent or gullies to cross. Both the East river and the Wamera carry a considerable volume of water, even at the height of the dry season, while heavy floods are said to be, and on the evidence of erosion would appear to be, frequent in the wet season. The dams, therefore, which, in order to give an artificial

head of water, are built across stream immediately below every intake, must be low enough to permit easy repair, and even easy reconstruction in case they are destroyed outright. All intakes are consequently located where the rivers are shallow, in spite of their greater width, where such is the case. The dams, which are made of water-worn boulders and stones, none larger than can readily be put in place by hand, piled loosely, so that the surplus water may easily escape through their interstices, and are never more than about 3 feet high, though they may run to quite 100 yards in length. When necessary, turf and brushwood are used to render the dams less permeable.

The main canals are simply ditches, seldom more than 5 feet wide, and often less, and a foot or 18 inches deep. We neither saw nor heard of any case in which artificial banks had been made to conduct water across the surface of the ground. The laterals are simply the same thing reduced to scale, and there are nowhere any hatches or flumes of wood, nor any aqueducts (except in the case mentioned above, where the canal from the East river crosses the gully). But the results are sufficiently creditable, if not indeed actually marvellous, when it is considered that they were conceived with no more knowledge of engineering than a practical appreciation of the fact that water runs downhill, planned without the aid of any instruments for ascertaining or correcting levels, and executed with no better tools than the workmen's digging-sticks and hands.*

Before the paper, the PRESIDENT: Dr. Seligmann, whose paper we are to hear and discuss to-night, is not appearing on the platform of the Royal Geographical Society for the first time. I dare say some of you present may remember that five years ago Dr. Haddon, whom I am glad to see here to-night, read a very interesting paper on the Torres Strait, Dr. Haddon having gone out there on behalf of the University of Cambridge. One of the members of Dr. Haddon's expedition was Dr. Seligmann, and those who were present that night may remember that on that occasion he added some interesting remarks to Dr. Haddon's paper. Dr. Seligmann has the advantage, in studying anthropology, of being a member of the medical profession. Since the time of which I have been speaking, he has travelled extensively in British New Guinea, and he will now give us the benefit of his investigations there. He is going to introduce what, I believe, is a novelty here—he is going to illustrate his lecture by means of the biograph, which, I am sure, will interest you. I now call upon Dr. Seligmann to read his paper.

After the paper, Dr. A. C. HADDON: It is with peculiar pleasure that I have followed this expedition of Major Daniels to New Guinea. Dr. Seligmann accompanied, as our President has said, the Cambridge Expedition to New Guinea in 1898-99, and he was one of the keenest and certainly the most versatile of my colleagues. Major Daniels, who had travelled a good deal in America, organized this successful expedition with Dr. Seligmann. They came to Cambridge for some months, and they thoroughly prepared themselves for their work, and the expedition was one of the best equipped that has ever left Europe. The credit of it, I may say, is due, in the first place, to the enthusiasm and the knowledge of Dr.

* ERRATUM.—Page 233, line 12 from top, for "west" *read* "east."

Seligmann, and secondly, to the enterprise, energy, and liberality of Major Daniels. Dr. Seligmann has not been able this evening to do justice to the scientific work that has been accomplished by the expedition. He merely gave us a sample, as it were, of what the expedition did, and it will take some years before we can learn all that was done. It may seem rather strange to you that he referred so much to the hair of the people, but I would remind you that in New Guinea we have a dark-skinned, woolly-haired, noisy, demonstrative people.' Now, the Australians have curly hair; and the Polynesians have a lighter skin and straight or wavy hair. The question is, how did the Australians get where they are? We heard in 1898 that in the Bensbach river in New Guinea there were some people resembling Australians; that looked as though they were relics of the people who had marched across into Australia. It is very satisfactory to know that this expedition went to Bensbach river, but they found that the people whom we heard were like Australians were quite typical Papuans. So in that respect the problem of the peopling of Australia is not nearer solution. Then, again, Dr. Seligmann spoke of certain curly and straight-haired people on the eastern part of New Guinea. That, again, is an extremely interesting problem, but there is very little doubt that these people have, at some time or other, migrated to New Guinea, and thus the straight hair of the Polynesians has unravelled the crinkly hair of the Papuans. Up in the mountains, as you have heard, the natives invariably have a dark skin and woolly hair, so it looks as if New Guinea was originally inhabited by dark woolly-haired people. But along the coast other people have come into New Guinea from the Pacific, and in these spots there is a mixture of Polynesians and Melanesians. Among other problems this expedition studied was totemism, an extremely interesting question which we cannot now discuss. Another point of very great interest which they studied was the decorative art of the different places, and especially of the south-east region and the islands. You saw in the lantern slides some very beautifully carved canoes; Dr. Seligmann has made a special study of these, and for the first time we have learnt what this carving means, for no one previously had studied this problem in the field. The study of decorative art can only be done satisfactorily on the spot; anybody can make guesses in museums, but they are not really worth the paper on which they are printed I may say that in this, as in all other subjects he has treated—hair, skulls, customs, religion—Dr. Seligmann has worked as thoroughly as possible within the time. I would like to say one word about the cinematograph films. Perhaps those accustomed to music-halls have seen films clearer and more brilliant; but it is extremely difficult work, as I know from my own experience, to take cinematograph films in the tropics. I have seen many of these dances, and I need hardly say that it is extremely interesting to me to see them again on the screen, but one does miss the colour, noise, and excitement—they are a very noisy people—and one also misses the indescribable odour of the Papuans.

Mr. Henry Balfour: I esteem it a very great privilege to have been asked to come here to-night and listen to this extremely interesting communication of Dr. Seligmann's. At the same time, I would gladly have been excused the duty you have imposed upon me, and for this reason—I have never been to New Guinea, and therefore can speak with no first-hand knowledge whatever. I always think it is far more interesting to hear those who have been on the spot. But at the same time, although I have never had the privilege of seeing the natives of New Guinea, I am none the less able to appreciate the work that has been done by those who went on such an admirably organized expedition as the one referred to to-night. It has been indeed a great pleasure to me to listen to the lecture and to see the photographic representations, not only of the natives in groups and still, but also of the natives in movement. I cannot but think that the more travellers are

encouraged to use the biograph in depicting scenes of native life, the greater will be the advantage to the study of anthropology. These biograph films undoubtedly record scenes realistically where mere verbal descriptions would fail. The films thrown upon the screen this evening really hardly require any description at all; they are descriptive themselves, and extremely instructive, and I hope that the Royal Geographical Society, amongst other bodies, will encourage in every possible way the utilization of this method by all travellers among savage peoples. Dr. Seligmann, as Dr. Haddon has pointed out, has only touched upon the surface, as it were, of the enormous mass of material which lies at the back of what has been presented to us to-night, and I feel quite sure that we shall all look forward with intense interest to the full publication of the results of this expedition, an expedition which I cannot but think has entirely justified the care and pains and expense which have been lavished upon it. After hearing so much about New Guinea, it may seem almost ungrateful to express the hope that expeditions will still continue to go there—what work has been done has been so admirably done that I think this may appear ungracious; but, at the same time, I look forward to one effect of this admirably equipped expedition, and that is, that it may serve as a precedent to others, or the same again—possibly, that would be better—to go out to New Guinea and conduct further researches yet. For this enormous island is one of the most interesting, ethnologically, and there is still a huge amount of work to be done there. A region to which Dr. Seligmann did just refer, the region along the borderland between Dutch and British territory in New Guinea is one that must be of intense interest ethnologically, and the interior, with the exception of a few regions, is as yet virtually unknown. It has been extremely interesting to hear what Dr. Seligmann had to say about those interior natives with whom he came into touch. That is one of the important results of this expedition. There are many questions that require elucidating, such as the routes by which the culture of one region has been transferred, partially at any rate, to another region. It would be interesting to know, for instance, by what route and by what methods objects that are clearly to be associated with the Papuan gulf have come to be transferred to such a distant region as the Bensbach river, in the north-east extremity of British New Guinea. There are problems such as these which await solution, and to which the attention of explorers might be drawn. I think that one of the most interesting discoveries has been the finding of the site of manufacture of the stone adzes which have become so widely spread in their finished form. This is a great point to have made out, and one upon which one would gladly have heard Dr. Seligmann expand more fully. Not only is it interesting in its ethnological aspect, but it also has its archæological interest, for, if we are to explain thoroughly the processes that went on in prehistoric times, in the Stone Age of early date, we are obliged to a great extent to look to the Stone Age of the modern savage for explanation, because there is a chance of seeing the actual processes at work, instead of having to fill up by guesswork, as it were, the lacunæ which must exist in the archæological records. In this way, the bringing together of the ethnological and archæological material cannot but be to the advantage of both systems of study. I should not be justified, Mr. President, in detaining you at this somewhat late hour with further remarks, which, as I pointed out, must necessarily be based upon second-hand knowledge; but I gladly take this opportunity of adding my thanks to Dr. Seligmann for his interesting communication. I think, in conclusion, that it is only just to Major Daniells that some reference should be made to the generosity with which he has presented the specimens forming the valuable collection brought back by the expedition to some of the principal museums of this country.

Dr. J. E. Marr: I feel I have no right to address this meeting after Dr. Seligmann's opening remarks. He said the expedition was essentially ethnological. Our work is essentially geological, therefore I will not detain you long. I should like to bear tribute, however, to the very careful way in which Major Daniels and his colleagues prepared for this expedition, as well as for the manner in which they carried it out. And although geology was a by-product of their work, Major Daniels and his colleagues came up to Cambridge and pursued for some time the study of geology. I should like all explorers, if possible, to do this. It is, alas! too often the custom of explorers not to make this preparation, but merely to press their specimens upon us and expect us to do the rest. Now, Dr. Seligmann made a remark about the apparent recent elevation of the country, and stated that it was perhaps not quite what earlier explorers had concluded. As a matter of fact, Mr. Gibb Maitland, the Government geologist of Queensland, wrote a report some years ago based upon incomplete information, and he has quite recently sent a paper which I have not yet seen, containing the result of the further examination of specimens. I should like to say something about the stone implements. It is very extraordinary the way in which the natives have selected the various stones that were available for particular purposes; they have got the very stone required as far as they could for each particular purpose, one for making adzes, another for making clubs with a perforation in the centre, another again for hammer-stones, and another for grinding-stones. They must have made implements for a very long time before they found the uses of all these stones for different purposes. However, I must not enter at this late hour into the geology of these implements, and I will conclude by saying that we at Cambridge, myself and my colleagues, have only just begun to touch the specimens, but we shall be glad to do all we can to work out the geological materials brought back by this very successful expedition.

Mr. Ray: At this late stage of the evening I do not intend to offer you any very lengthy remarks. I should like to add my tribute to Dr. Seligmann for the extremely interesting set of views which he has shown us this evening, and for the extremely lucid way in which he has explained them. It is one evidence of the care which has been taken by the expedition to gain knowledge upon these points; one evidence of that is shown by the portions of New Guinea which have been illustrated to-night. We first had the western portion by the Bensbach river. The question arises as to the New Guinea people, how they came to the Torres strait, and through that to Australia. I was struck, in that first picture, by the likeness of the Torres strait islanders with New Guinea. We also find connection between their language and the people of the shore. But those languages which are like those in New Guinea are not like those of Australia, so that they bear out the non-connection between New Guinea and Australia. Then later Dr. Seligmann showed us some pictures of the mountain people further up by the St. Joseph river, and some of the people further inland, and he told us that these Mekea people were between the mountain people and the coast people; that also is born out by their language. The Mekeo is one of the strangest in that part of New Guinea; it is similar to Motu, but it contains a great deal of some strange element which has not yet been determined. Then further on Dr. Seligmann took us to the eastern end of the archipelago, and there he showed us that the people have traded from time immemorial westward along the coast, and there also we find the language bears out the very same statement. The languages from the Woodlarks right away along the coast, along in the path of the stone implements, the language is all practically connected, and there the expedition has done good work by showing that connection, and also showing that those languages extend far down to

the south-east right away into the Solomon islands, and further still into the New Hebrides. This shows how carefully the expedition touched upon what may be regarded as the three principal points in New Guinea. There is another point on the north coast which should have been touched, but I do not think the expedition got so far. But, at any rate, Dr. Seligmann has shown us to-night what there is to be done in New Guinea. There is a great deal to be done; there are some very interesting problems to be worked out, and I hope before long we shall see some other expedition going there to follow up the good work and extend our knowledge of that part. I thank Dr. Seligmann for his interesting paper.

The PRESIDENT: I do not know whether there is any one else present who knows anything of New Guinea; if not, I will ask you to join in a vote of thanks to Dr. Seligmann for his interesting paper.

Dr. SELIGMANN: I am sure it is very gratifying to hear all these pretty things said, and to receive your very hearty vote of thanks, for which I thank you very much, both on my colleagues' and my own behalf.

THE GREAT TARAWERA VOLCANIC RIFT, NEW ZEALAND.

By JAMES MACKINTOSH BELL, Director New Zealand Geological Survey.

IT is not yet twenty years since there took place the great eruption of Mount Tarawera, New Zealand, on June 10, 1886; but already great changes have taken place in the configuration of the country and in the display of hydrothermal phenomena, not only in the volcano itself, but along the great rift formed at the same time.

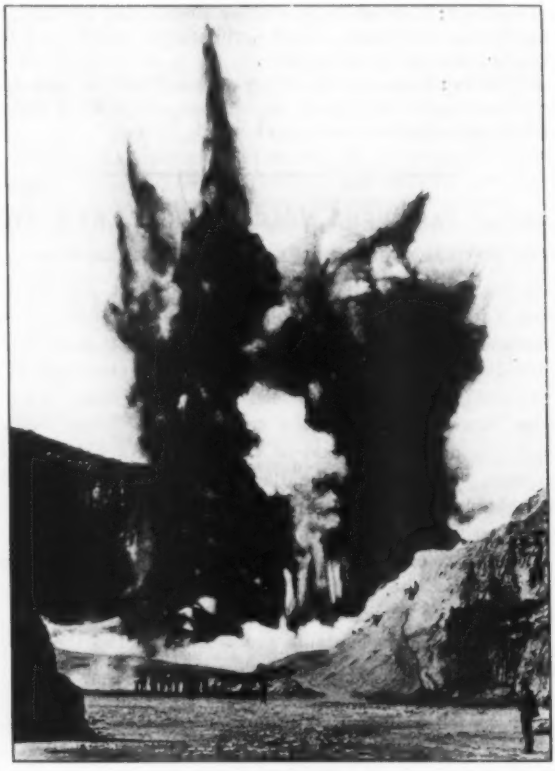
Mount Tarawera lies near the centre of the Taupo volcanic zone, and about 135 miles south-east of the city of Auckland. The Taupo volcanic zone, so named by the Baron von Hochstetter, is one of the most remarkable geological features of New Zealand, and extends from the south-west of the great volcanic cones of Ruapehu, Tongariro, and Ngaurahoe, to White island, on the Bay of Plenty—a distance of nearly 160 miles. The width of the volcanic zone, according to Prof. A. P. W. Thomas, of Auckland, is some 25 miles.* The area enclosed within these dimensions contains practically all the thermal springs, geysers, fumaroles, and expiring volcanoes for which New Zealand is justly famed.

Though the whole Taupo volcanic zone was more or less affected by the Tarawera eruption, only a comparatively small portion of it was very seriously influenced. This very pronounced influence was felt in the immediate neighbourhood of the great rift, or more correctly line of craters, which stretches from Mount Wahanga, the most north-easterly part of the Tarawera range, to a point about 600 yards north-north-west of Lake Okaro. The length of this huge fissure is about 9 miles, and its direction N. 68° E., while the trend of the Taupo zone in general is 20° more northerly.

* See 'Report on Eruption of Tarawera and Roromahana, New Zealand,' p. 5, by Prof. A. P. W. Thomas.

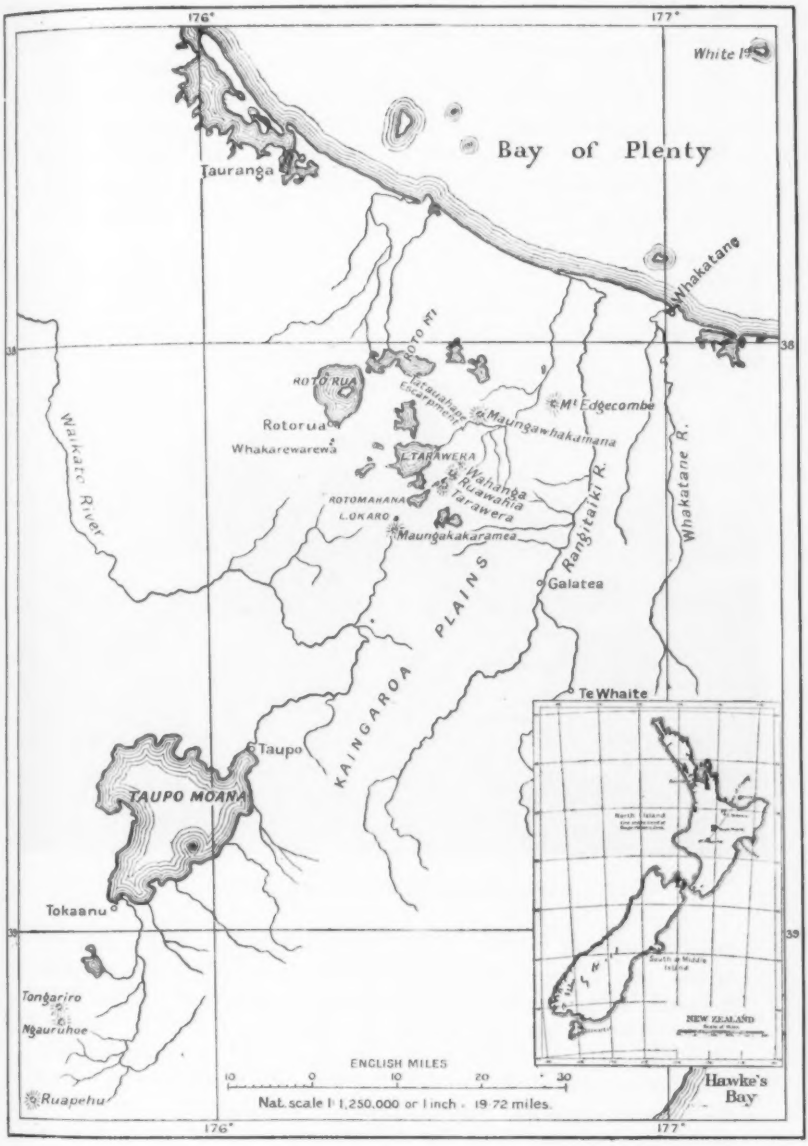
By the eruption of Mount Tarawera, 130 people were killed, the world-famed pink and white terraces were destroyed, and the country for an area of over 6000 square miles devastated.

The Tarawera range is a very prominent feature in the topography of the north island of New Zealand, and above the low country which surrounds it it stands out with very decided relief. The range comprises three peaks: Mount Wahanga, quite distinct, and Mount



WAIMANGU GEYSER IN ERUPTION.

Ruawahia and Mount Tarawera, which are practically one peak. Prior to the eruption of 1886, Ruawahia, the highest peak, had an elevation of 3606 feet, to-day it is 3770 feet. The great rift cuts the summit of the Tarawera range, and appears on its south-western slope. West-south-westward from the Tarawera range, and in the same direction as its main axis, lies Lake Rotomahana. In continuation along the same line are the deep holes forming the Black crater, the Fourth crater, the



TAUPO VOLCANIC ZONE

Waimangu crater, the Inferno crater, the Echo lake crater, and the Southern crater. These will be described later.

Lying north-west of the Tarawera range, and just at its base, is the lake of the same name, with a length from north to south of about 9 miles, and a width in the opposite direction of some 6½ miles. The lake is surrounded by broken volcanic hills which rise to a height of 400 or 500 feet. North-westward and northward from Lake Tarawera lies a rugged volcanic country, dotted with numerous lakes, the largest being Lake Rotorua. These lakes appear to fill depressions formed by the

HIGHEST KNOWN ERUPTION OF WAIMANGU.

down faulting of limited areas in a lava plateau, which formerly existed, and is now represented by the flat volcanic hills which border the lakes or their basins. North-eastward from Mount Tarawera extends a series of low hills, clothed in a monotonous cover of volcanic ash, broken only by the tall leafless stumps of trees, which remain as a ghastly tombstone of the dreadful eruption. On this landscape, Mount Maungawhakamana and Mount Edgecumbe, two elevated volcanic peaks, stand out in definite relief. Far to the north-eastward lies the Bay of Plenty, surrounded by a narrow coastal rim, the beginning of a coastal plain. East and south-east of the Tarawera range lies the dreary,

slightly rolling expanse of the Kaingaroa plains, devoid of trees, and terminated by the Whakatane range, which rises with the singular abruptness of block mountains just east of the Rangitaiki river. Westward, the Kaingaroa plains lose their level character, become much more broken, and are surmounted by several volcanic peaks, the most prominent of which is Mount Kakaramea. The whole country immediately along the great rift is quite devoid of vegetation save for the native grass toi-toi and tutu, which have been able to find sufficient material for sustenance in the new volcanic tufa ejected at the last eruption.

All rocks of earlier age than the eruption of 1886 are hidden beneath

FRYING-PAN FLAT AND ECHO LAKE CRATER ARE THE SAME.

a thick covering of cinders, scoria, and ashes, ejected at the time of the eruption. This deposit follows, however, the pre-existing contours, and on the more angular hills has merely rounded their outlines. The deposit of tufa, of course, is exceedingly soft, and though it has become somewhat packed within the nineteen years which have intervened since the eruption, it still shows practically no consolidation, and has become deeply sculptured by innumerable streamlets and rills, which intersect it in all directions. Viewed from the top of Mount Tarawera, the surrounding country resembles an immense ploughed field with furrows of gigantic size.

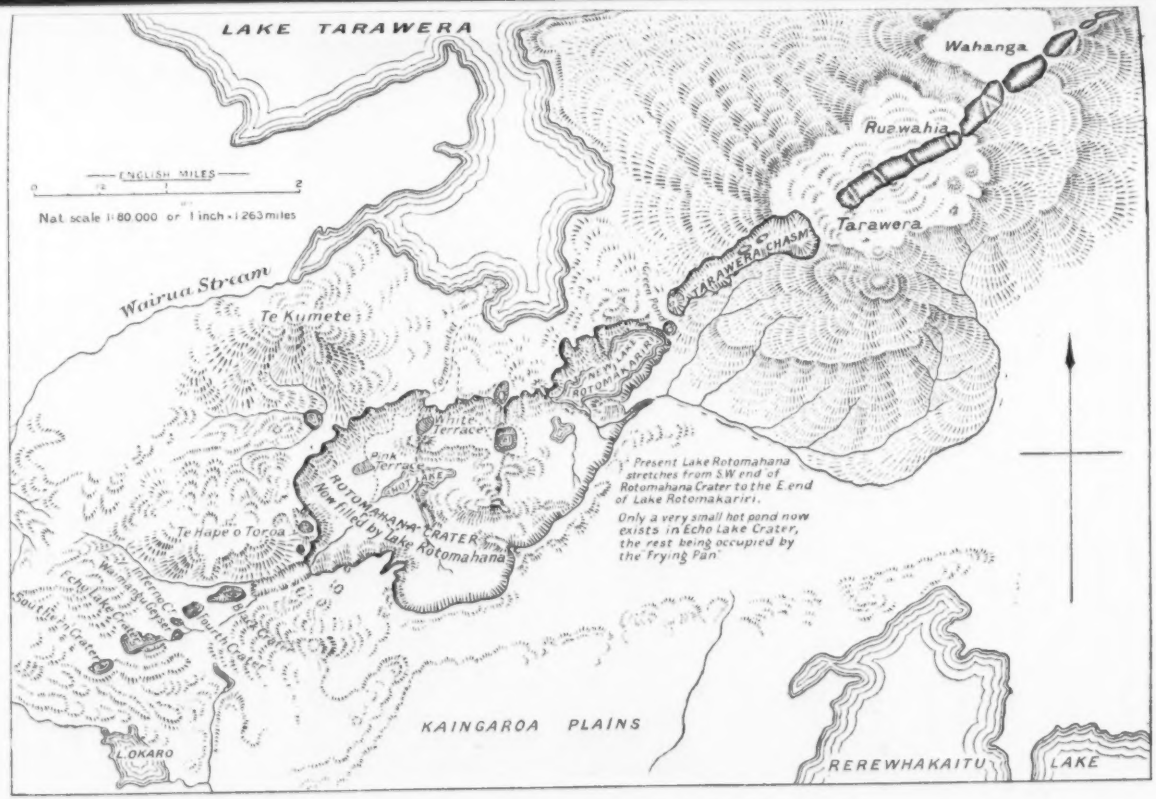
The geology of the Tarawera area is simple. The rocks are entirely

volcanic, though the various species are of somewhat different origin. Apparently the oldest rocks consist of trachytic and rhyolitic lavas of slightly different petrographic character. Overlying these, or possibly in part contemporaneous with them, are thick beds of acidic tufas and agglomerates. These fragmental rocks are of the same chemical composition as the lavas, and probably represent the comminution by the force of explosion of the latter. Above these acidic rocks are the deposits of the recent eruption, which are much more basic in character.* Lava rose to the surface only on Tarawera mountain itself, and even then it flowed only a very short distance from the lip of the crater. It has been identified as an augite andesite, almost basaltic in character. The volcanic dust ejected at the same time vastly exceeded the lava, since the eruption was intensely explosive in character, due to the enormous quantity of steam. The ejecta are naturally thickest near the fissure, being on Tarawera mountain upwards of 20 feet, and narrowing laterally. In general, its thickness is greater towards the east than to the west.

The great fissure on the summit of the Tarawera range, though practically continuous, is divided by low partitions into several somewhat distinct craters. On the summit of the range, the craters are in general funnel-shaped, with the lower part of the walls—consisting of lava—steep and precipitous, but tremendously shattered. The upper part of the walls, being composed of soft tufa, are of more gradual inclination. Originally, the deepest crater was upwards of 800 feet in depth, now it is scarcely 500 feet, the bottom being filled with the *debris* which has fallen in from the sides. The colouring in the craters is magnificent. The lavas, encrusted with sulphur and stained with iron rust, are fresh shades of yellow and orange. The acidic tufas are tinted orange or black, while the recent tufas show interbanded layers of a brilliant hematite red and deep rich purple. Steam, slightly charged with hydrogen sulphide and other gases, issues at various points within all the craters, though seldom in great quantity. However, the actual amount varies with atmospheric conditions. On the south-west side of the hill a long narrow rift extends to the base of the hill, on the edge of Lake Rotomahana. The slopes of the Tarawera range extending towards the north-eastward and north-westward are of beautifully rounded outline, and, completely clothed in a thick covering of blackish and reddish cinders, are quite devoid of any signs of vegetation. For several years after the eruption of 1886 billets of wood could be ignited by inserting into the crevices along the slopes of the range, but now a temperature above that of surface is observable only at the points where fumaroles issue.

The most north-eastern crater of the great rift lies on the south-

* See Report by Prof. A. P. W. Thomas.



TOPOGRAPHY OF THE TARAWERA VOLCANIC RIFT
SOON AFTER THE ERUPTION OF 1886.

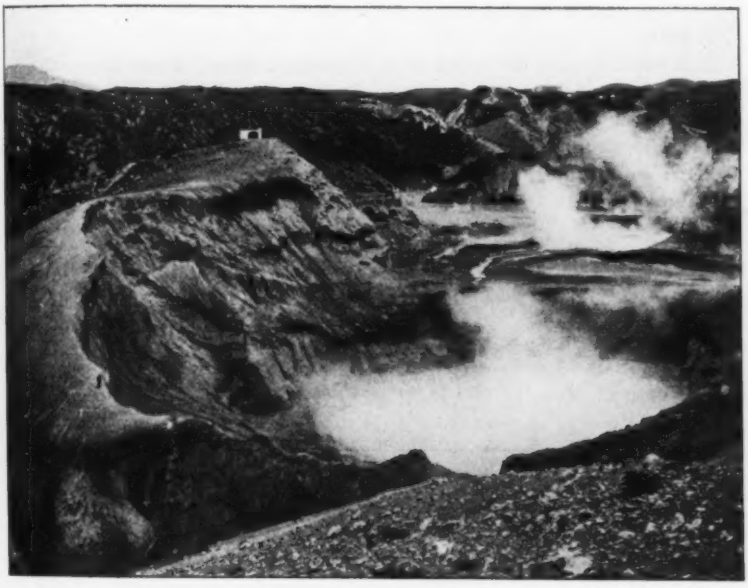
western slope of Mount Wahanga. Its sides have collapsed to a greater extent than have those of the other craters on the summit of the Tarawera range. The colour effects of this crater are especially fine, the contrast between the light yellowish-white tufa and the bright carmine and purple ash overlying being exquisitely marked. From the summit of Mount Ruawahia a splendid view of the surrounding country is obtainable. Far to the southward are visible the lofty snow-clad peaks of Mount Tongariro, Ruapehu, and Ngaurahoe, the latter generally capped by a cloud of steam. Somewhat nearer is the broad basin of Lake Taupo, surrounded by hills of irregular shape, the most

WHITE TERRACES (NOW DESTROYED).

pronounced being the cone-shaped peak of Mount Tauhera, located on its northern edge. The wide valley of the Waikato is traceable for miles, bordered by flat-topped hills to the westward. Eastward may be seen the desolate waste of the Kaingaroa plains, bordered by low wooded hills. Northward one looks upon a beautiful lake-dotted country, with occasional patches of timber; while away to the north-eastward can be seen the broad expanse of Bay of Plenty, dotted with numerous volcanic islands, among which is White island, bathed in steam.

Lake Rotomahana, which lies just to the south-west of the Tarawera range, is separated from the rift on the slope of the range by a deep

pond, with steep walls, which fills a small crater. Lake Rotomahana is a sheet of dirty muddy green water, some 3½ miles long by less than 2 miles in the opposite direction, and with a maximum depth of 427 feet. It occupies the site of an immense crater, which was evidently, from all accounts, the most active point of the Tarawera eruption. Immediately after the great outburst there was comparatively little water, distributed in a number of small ponds, in the huge hole, but with no outlet the water gradually rose, and to-day is still rising, though much of the water entering the lake must find some subterranean outlet.



WAIMANGU BASIN (DORMANT).

The boundaries of Lake Rotomahana, as it now exists, practically correspond with the walls of the crater. The world-renowned pink and white terraces, and many other remarkable hydrothermal phenomena, were formerly to be seen, surrounded by a scant but beautiful shrubbery, where now is visible only the waters of Lake Rotomahana, bordered by dreary hills of volcanic ash and scoria, practically devoid of vegetation. The low hills, well sculptured into innumerable shallow sharp ridges and valleys, descend in places gradually to the lake-shore, or again rise abruptly in precipitous cliffs from the water's edge. Thermal action is at present limited to the western end of the lake, where, however, there is abundant evidence of the proximity of a heated interior. At this

point the stratified tufa beds are much faulted and cracked. From the cracks great columns of steam continually ascend, and in places belch forth under considerable pressure. Springs of boiling water issue at numerous points, and some of these are depositing thin crusts of whitish silica. Some of the steam-jets are faintly solfataric in character. During the winter of 1905, a portion of the low cliff close to the shore in this part of the lake collapsed, and soon after a geyser appeared where the steaming cliff had been. It is said to have played to a height of 150 feet, though in general the height was much lower, and after the first four days the jet of water never ascended higher than 12 feet. After playing almost constantly for about two weeks, the geyser ceased altogether.

A warm stream, the outlet from Waimangu crater, enters the south-western end of Lake Rotomahana. It flows in a low flat, which has been eroded by its own action, and that of a cold-water stream joining it, in the soft tufa beds. At about half a mile from the lake the valley of the warm-water and of the cold-water stream divides, and each narrows considerably, being hemmed in on either side by almost vertical walls.

The Black crater, which lies about three-quarters of a mile west-south-west from Lake Rotomahana, is roughly the form of a dumbbell, and is made up of two deep funnel-shaped holes, divided by a low partition. Though very active for some time after the great eruption, thermal action is now evident only in a few fumaroles, which deposit thin coatings of sulphur. In rainy weather, however, there is considerable steam to be observed within the crater.

Close to the Black crater is the fourth crater—a deep, narrow, almost circular hole with steep trachyte walls. Very little steam issues from its sides. Just south-west of the Fourth crater are the great deep craters of the Inferno and Waimangu; both flow continually, the streams running in steaming cascades and uniting about 50 yards below each outlet to form the hot stream which enters the western end of Lake Rotomahana. Just below the junction a small geyser plays almost unceasingly in a column 5 or 6 feet high, forming a low angle with the horizon. This geyser has been in action only since the cessation of the great Waimangu geyser.

The Inferno is a deep round pool, bordered by steep walls over 300 feet high on its northern side, but much lower towards the south at the outlet. The temperature of the pool is about 180° Fahr., and its surface is rather less than 2 acres in extent. Clouds of steam charged with hydrogen sulphide are continually belched forth from the dark dismal pool, and a view of its surface, almost continually on the boil, is seldom obtained. Frequently it booms ominously, but only on rare occasions has it been known to exhibit geyser action. The most notable time was about two years ago, when it is said to have suddenly

burst into action, and a column of water ascended vertically about 150 feet from a point near the centre of the pool.

The geyser of Waimangu has for years been the greatest wonder of the thermal wonderland. The geyser was discovered in January, 1900. It is not supposed to have been active much before that date, as at the time of discovery ferns were observed growing close to the edge of the pool. While playing, outbursts occurred nearly every day, and sometimes more frequently. The shots were of gigantic proportions, mud, sand, and immense boulders being propelled in huge columns of dirty

MOUNT WAHANGA, SHOWING THE GREAT RIFT.

black water vertically into the air. At some hundreds of feet above the water the column broke into a great cauliflower-shaped mass, surrounded by clouds of steam, which showered the boulders, mud, and sand back into the pool, and even high up on the walls which surrounded it. The highest shot is supposed to have ascended to a height of 1500 feet above the water, and to have carried a volume of 800 tons. Accurate data relating to these dimensions are difficult to obtain. The outbursts of this wonderful phenomenon were awful in the extreme, the magnificent proportions appearing to even dwarf the heights of the hills around. In July, 1904, the great geyser suddenly ceased, and for seven weeks and five days remained dormant; then it again burst into action, and until the 1st of November of the

same year almost daily outbursts occurred. Then it stopped, and up to the present there has been no further explosive activity. The whole explosion usually lasted about forty seconds, the initial ascent being much more rapid than the descent. The temperature of Waimangu is about 130° Fahr. Its surface is quite placid, and steam only occasionally rises. A blackish deposit, consisting chiefly of free sulphur and of ferruginous sulphides, is formed on the edge of the pool. While in action the pool of Waimangu was 130 feet long by 80 feet wide; but since the geyser has ceased playing, these dimensions, owing to the insilting by the entering streams, have considerably lessened. The outlet from Waimangu is on its eastern side, while on the south-western side a chute of warm water falls over a low cliff from the Echo Lake crater.

About ten years ago Echo Lake crater contained a lake almost a quarter of a mile long, and of about the same width; it has now diminished to a small pond a few yards across, lying at the base of a cliff of variegated tufa (known as Gibraltar rock) from which numerous steam-jets issue. The temperature of the water is just under the boiling-point. An immense boiling spring enters the pond just at the base of Gibraltar rock, but its temperature is decreased by the entrance of a small cool-watered stream. About halfway between Echo lake and the edge of Waimangu is the Devil's blow-hole, an immense jet of steam which issues under enormous pressure. According to the intelligent Government guide at Waimangu, Mr. H. M. MacPherson, the force of this blow-hole has tremendously increased since the cessation of Waimangu. However, he does not think that the increase is sufficient to account for all the steam which formerly found exit in the gigantic outbursts from Waimangu. My distinguished predecessor, Sir James Hector, who has for years watched the movements of the New Zealand geysers, considers that it has ceased on account of the increase in the diameter of the orifice through which the boiling water, supercharged with steam, issues from its subterranean reservoir.

South-west from the dwindled Echo lake, and forming the floor of the remainder of the crater, is the curious flat known as the Frying-pan. Its surface consists of tufa, hardened mainly by silica, but in part by incrustations of alum. Through this crust spout innumerable small jets of boiling water, which bathe the strange plain in clouds of steam. A walk over the Frying-pan is most uncanny. The plateau is at a temperature but little below the boiling-point, and, though not actually very thin, the numerous apertures through it give the effect of walking upon tissue paper.

The Southern crater, which is the most south-westerly of all the craters along the line of the great rift, lies about 200 yards south-west of the Frying-pan. Like most of the craters, it is bordered by precipitous walls. It is filled by a pond of greenish water, 50 or 60 yards across by 100 yards in length, and 60 or 80 feet deep. Some years

ago the crater was quite dry. Unlike the other craters, it shows no signs of thermal activity. The immediate effect of the Tarawera eruption upon the other thermal centres of the Taupo volcanic zone was often very pronounced. The springs about Rotorua gave striking evidence of increased flow. At Whakarewarewa new geysers burst into action, and at Waiotapu new fumaroles and other thermal phenomena appeared. There seems to have been little or no influence upon the thermal centres around Lake Taupo and along the Waikato valley.

BRAIN POT AND POHUTU GEYSER, ROTORUA.

The effect of the immense earthquakes which accompanied the eruption are very apparent; several wide parallel cracks, subsequently enlarged by atmospheric agencies, traverse the level plain known as Earthquake flat, on the road between Waimangu and Whakarewarewa, and another of considerable proportion is observable on the road between Rotorua and Lake Tarawera. Some of the cracks in Earthquake flat show a very decided vertical displacement of strata.

The effect of the Tarawera eruption on the drainage channels of the district was decided. Streams were temporarily dammed, and former outlets of lakes were obliterated. The influence upon the level of Lake

Tarawera is especially interesting. During the eruption the bed of Tarawera creek, which drains the lake of the same name, filled up, and the lake immediately started to rise. For years some of the water found exit through cracks in the tufa which filled the creek bed, appearing at the base of the Tatauahape escarpment, some 2 or 3 miles below the lake. Just after the eruption the lake is said to have risen 28 feet; from that time until November, 1904, it ascended 42 feet in all. Then the water rose over the dam of tufa which prevented its exit along the old channel, breaking much of it away. The water in the lake almost immediately dropped over 11 feet, and, flowing along its old channel, fell over the Tatauahape escarpment, forming the falls of the same name. Low cliffs, marking the former level of the lake, testify to the changes which its surface has undergone.

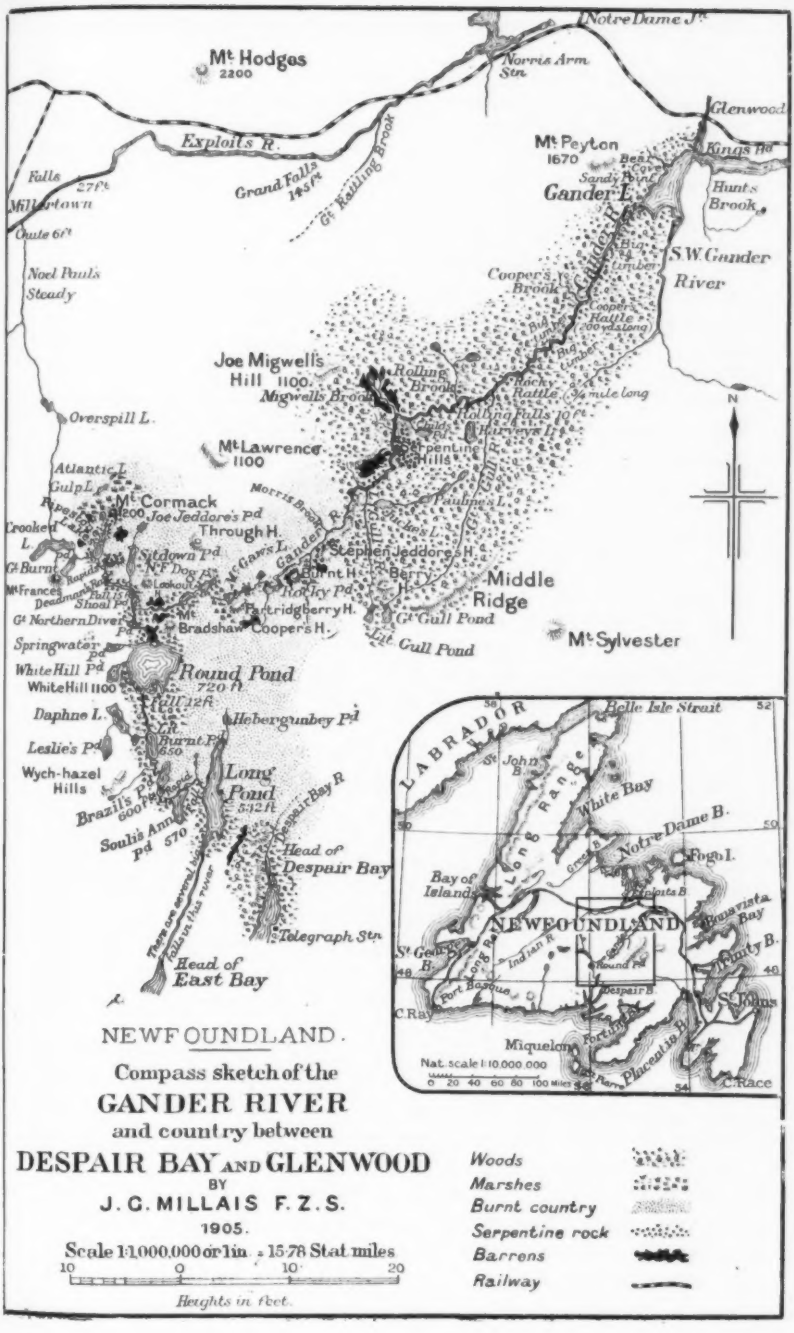
The Taupo volcanic zone, with its abundant evidence of expiring vulcanism in the form of geysers, fumaroles, and boiling springs, forms one of the most fascinating areas for scientific investigation, in a country so rich in natural phenomena as the islands of New Zealand.

CENTRAL NEWFOUNDLAND AND THE SOURCE OF THE GANDER RIVER.

By J. G. MILLAIS, F.Z.S.

It is somewhat surprising that the interior of Newfoundland should be less known than parts of Central Africa or the Arctic Regions, and still more so when we consider that the island has been occupied by Englishmen since the days of Henry VII., and is our oldest colonial possession. But the reason for this lack of enterprise is not far to seek. A colony must, in the first place, be in possession of funds to send out properly equipped geographical expeditions to ascertain its natural features, and in this respect Newfoundland has been somewhat handicapped, but not to such an extent that there is any excuse for the lack of ambition to know their own country on the part of the various Newfoundland governments. Parsimony and the conditions of trade have ever been the island's watchword, so practically nothing was done to ascertain a knowledge of the interior or its natural resources until William Cormack made his memorable journey in 1822. In spite of considerable opposition, this brave pioneer set forth on foot, accompanied by one Indian, Sylvester by name, and crossed the island from Trinity bay to St. George's bay, taking just over two months in which to complete the arduous journey. The introduction to the short account of his travels * is both instructive and sarcastic, showing as it does the attitude of the authorities towards his undertaking.

* 'Narrative of a Journey across the Island of Newfoundland.' By W. E. Cormack. The only one ever performed by a European. St. John's: 1873.



NEWFOUNDLAND.

Compass sketch of the

GANDER RIVER

and country between

DESPAIR BAY AND GLENWOOD

BY

J. G. MILLAIS F.Z.S.

1905.

Scale 1:1,000,000 or 1in. = 15.78 Stat. miles

10 0 10 20

Heights in feet.

"Early in the spring of 1822, being in Newfoundland, a far-famed country in which I felt a most lively interest, and free from professional engagement, I determined upon exploring the interior of the island, a region almost totally unknown, and concerning which and its inhabitants, the Red Indians, who were supposed to occupy the whole of it, the most besotted conjectures were entertained, particularly by the chief delegated public authorities, to which quarter one was inclined to look for some proofs of a feeling of interest for the condition of the country, *through the means of which they obtained their bread.*"

Cormack, although not a geographer, marked several important points, such as Mount Sylvester, which he named after his faithful Indian, the two Maelpegs, and George IV. lake, whilst Cormack lake and Mount Cormack, the central spot of the interior, were named after him. About the year 1868 Alexander Murray and William Howley were granted small funds to survey the interior. Sometimes they were not even allowed to choose their followers, a most important point in every expedition. Yet the amount of work done by these able geographers will bear lasting tribute to their energy and determination. The main waterways leading into the interior, such as Grand lake, Red Indian lake, the Terra Nova, Long Harbour river, the East bay, and the La Poile river were all surveyed and charted, principally by Mr. Howley, whose great work has never received proper recognition, although he has spent his best years on the subject, and risked his life many times. The difficulties of travel in Newfoundland are such that none but the most experienced voyagers can surmount them, and Mr. Howley has always been accompanied by Indians, except on occasions when the various Governments have forced their useless partisans in his service.

Naturally it was quite impossible for even such a man as Howley to be invariably successful in his work, and much of it had been done from hearsay or conjecture and by adhering closely to the waterways themselves. Consequently matters of importance, such as the natural features in shape of mountains and lakes in the immediate neighbourhood of the waterways, were often incorrectly charted or left out altogether. On the whole, however, Mr. Howley's work is most reliable.

It was to fill up some of the gaps in the unwritten page, and to discover, if possible, the actual source of the Gander, the second largest river in Newfoundland, that I set out on my third expedition to the country in 1905. After a month spent in whale hunting, and in examining whales for a work on British mammals on which I am engaged, I was met at Placentia on September 1 by my friend John McGaw. McGaw had previously studied geography and surveying, and had received considerable help in map-making from the Geographical Society, who seem always ready to assist their pupils, an unselfish

duty which other scientific bodies might follow with advantage. I found him an admirable companion, a good shot, and an industrious worker at whatever subject he turned his hand. It made our duties light and pleasant, for whilst he surveyed one line of country I could attend to another, and in the evening we joined forces and made our map together.

Dense fog enclosed the whole of the south coast; but when we arrived, after two days in a steamer and one in a schooner, at our starting-place on the banks of a small river at the head of Despair bay, the sun shone out brilliantly, and for a month and more we enjoyed the most delightful weather, the average temperature being very much the same as Scotland, although somewhat colder at night. Starting on September 3, and accompanied by six packers, exclusive of our own four helpers, we journeyed across a small range of hills to the large lake known as Long pond, a distance of 6 miles from the head of Despair bay. Here the packers left us to our own devices, and we travelled across Long pond 2 miles, and up the East Bay river to Soul's Ann pond, another large lake, where, bad weather coming on, we were detained for a day and a half.

To the east of Souli's Ann pond the whole country is sparsely wooded, except round the lakes and rivers, where the timber is more dense. The trees consist of white pine, red spruce, black spruce, larch, white and black birch, poplars (haps), maple, mountain ash (dogwood), choke cherry, small wild cherry, hazel, and alder.

The "open ground" or "country" is covered with "Indian tea" bush, goudie (*Kalmia glauca*), a lovely flowering shrub, and dwarf spruce, creeping birch, and juniper. On the ground are various mosses, notably the common reindeer moss, and a large number of berries, cloudberry, cranberry, partridge-berry, bearberry (*Empetum nigrum*), a favourite food of the Canada goose, whilst blueberries grow in vast quantities wherever the forest has been recently burnt.

Immediately round Souli's Ann pond the whole country is "burnt," and the melancholy area of destruction extends as far as the eye can reach to the east and west. This great gaunt sea of grey poles is now interspersed with young and growing timber of various kinds, some of it 10 and 15 feet high, and affords good cover for game, and in the course of twenty years the country will again recover itself to a certain extent. It takes about eighty years for a forest to grow.

The fire which created this terrible destruction began in the autumn of 1893, immediately to the west of Brazil's pond. Its origin is unknown, but in a dry season it made rapid headway and burnt out the whole of Souli's Ann, Brazil, Little Burnt, and the eastern side of Round pond. The Indians say that it smouldered all the winter and then started again in the spring, and, favoured by a south-west wind, burnt as far north as it could go to Crooked lake and Pipestone. It

also worked down the Gander a short distance, and afterwards turned north-east along Great Rattling brook, and reached the railway at Badger brook, where it stopped. The western side of Round pond was missed by the fire, as well as a 5-mile strip of white pine near Great Rattling brook, a section reported to be the finest timber in Newfoundland. On September 7, in beautiful weather, we paddled up Brazil's pond, and at noon entered the short section of the East bay that connects this lake with Little Burnt pond, which is 650 feet above sea-level. Here we found walking and frequent portages necessary, owing to the difficult and rocky character of the stream. It was in such places that our Indian guide, Joe Jeddore, exhibited his great skill as a canoeman. Standing up in the light 16-foot basswood boat, he poled through rapids and past rocks where the less accomplished white men had to toil in the water emersed to their waists. The slippery character of the bed, too, created occasional disaster, and more than once we saw our faithful but somewhat clumsy followers disappear in the shallow torrent. But all discomfort was undergone by the Newfoundlanders with that cheerful stoicism which marks them as the hardy and good-natured race which they undoubtedly are.

At the north-west corner of Little Burnt pond, and looking from the ridge of the Wych-hazel hills, three lakes can be seen. One of these, Lake Daphne,* is about 3 miles long, and is a considerable sheet of water. In existing maps, Little Burnt pond seems to extend almost to the entrance of the large lake known as Round pond, but this we found to be a mistake, for there is a connecting portion of the East Bay river, nearly 3 miles in length, with a fall of 12 feet half a mile from Round pond.

In darkness we reached Round pond, the largest sheet of water in Central Newfoundland, and camped there for the night. Looking across the glassy waters away to the north-east, we could see the peak of Mount Bradshaw (called after one of Alex. Murray's able assistants) towering up above the green timber, and the only landmark visible. Round pond is another somewhat dangerous sheet of water to circumvent in small canoes, so we had to be careful next morning, as a good breeze was blowing astern as we headed northwards. At nine o'clock the Indian spied a large caribou stag about a mile ahead, and after a long and hard paddle I headed the beast and shot him at 150 yards. Meat being an essential compensation for hard work in the wilds, we were all delighted at this piece of good fortune, and continued our journey in high spirits to the north end of the lake, where a brook comes in from the north-west from a small pond called by the Indians Godoleick, or Spring-water pond. Here were noticed several good outcrops of pure petroleum oil, which made long green streaks on the shores of the lake.

* In Stanford's map, roughly marked as Ahwachanjeeth pond.

Something might be made of these, as well as the abundant chrome-iron deposits which we afterwards saw near Mount Cormack, were transport not so difficult. At noon we continued westwards up steady water for 1½ mile, and then entered a small pond of about three-quarters of a mile long, which we called Great Northern Diver pond, from the abundance of these fine birds which are to be found there. Continuing upstream, we reached another unmarked pond of about a mile long, which might appropriately be named Shoal pond from its extreme shallowness.

This being a good point from which to strike east over the unknown country at the headquarters of the Gander, I decided to cache the

ASCENDING THE EAST BAY RIVER.
(*Photo by J. McGaw, Esq.*)

greater part of our stores on an island, where bears could not get at them, and to proceed northwards on the following day on a flying visit of a week's duration to Lakes Pipestone and Sit-down, Mount Cormack and its environs. Next day accordingly we travelled light with three canoes, and after spending a day in surveying the country to the east and marking the position of Look-out hill (850 feet), we continued up-stream for two days, reaching Pipestone on the evening of September 13. From Dead Man's rapids, a rough series of broken waters, the river was exceedingly difficult, and the men in constant trouble with the canoes, and at the rapids a portage of half a mile was found necessary.

Pipestone we found to be very unlike its aspect on the map. It lies

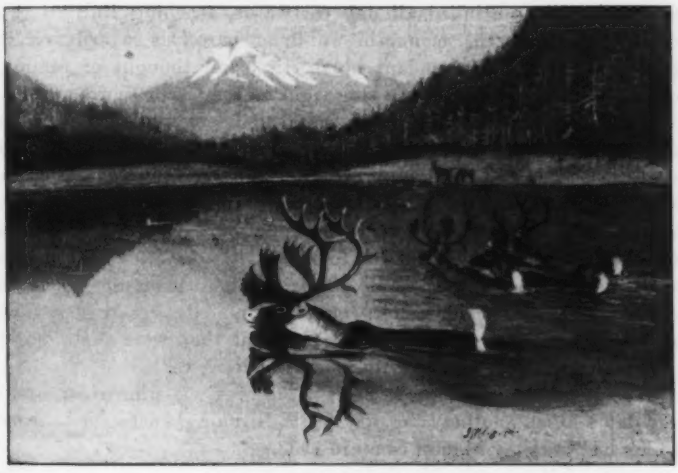
almost due north and south, and is equally divided into two sections, each about 1½ mile long, and divided by a narrow bar of stones some 10 yards wide. The country was flat, burnt, and exceedingly melancholy, with its great sea of burnt poles. The two highest mountains within our view were Mount Cormack and Sit-down hill, which we ascertained to be 1200 and 1150 feet respectively. In several maps Mount Cormack is placed about 4 or more miles to the east of Pipestone, but such we found to be quite incorrect, there being no mountain of any size in this direction. The best map (Stanford's) places it 4 miles due east of Pipestone, which is itself marked in such a fictional manner as to cause one to wonder if the geographer who arranged its form and direction had ever been within view of it. Pipestone lies due north and south in two sections, and Mount Cormack, as known to the Indians, lies due north of the lake, only a mile away. McGaw walked to the summit in half an hour and took observations, whilst I visited Sit-down pond (Enuchabeesh Gospen) and Sit-down hill, from which a magnificent view was obtained. Seven miles to the west the trees above Great Burnt pond could be seen, and just south of this rose a high mountain apparently as lofty as Cormack, and which I called Mount Frances. We spent another day in the Pipestone country, making sketches of the country and seeing great numbers of female caribou, and a great rarity in the shape of a jet-black fox. To the north-east we noticed a brook flowing into Sit-down pond, and this comes from a small pond which we called Joe Jeddore's pond, as Joe was the only man who had ever been there.

When it rains in Newfoundland, the heavens seem to open and let loose the water, not in buckets, but in ponds, and a day of this saw us, like drowned rats, retreating to Shoal pond, where we had left our stores. The following morning we made a start up the brook which leads to Dog pond. The heavy rain of the previous day had been of great assistance to us, for we found that the small stream up which we had calculated to pack was negotiable by canoes if carefully handled. We made about 5 miles that day, and in the evening found ourselves on a small lake, which is named Little Dog pond, where we had the good fortune to pick up a couple of wild Indian boys named Matthews, who were hunting caribou. After some parley, they agreed to come with us for a week or ten days, and to help us over the difficult country between Dog pond and the Gander. The next day we made Dog pond, where I killed a caribou doe, as we were quite out of fresh meat, and paddled to the north-east corner of the lake, where we camped for the night.

This point is close to the watershed of the two great river systems of Newfoundland. We could not, therefore, rely on water to help us for any distance on our eastward journey, except by using for a short spell the three small lakes that were said to exist between Dog pond and Burnt hill, a mountain overlooking the Gander at a point where I

hoped to again float the canoes. On the map this distance may be roughly estimated at 20 miles, but as the packers had to go the distance proved to be over 30 miles, whilst on foot and skirting the mountains to the south, McGaw and I found that we had walked nearly 40 miles.

After disposing of the stores and taking such things as would be necessary for myself and my companion for eight days, McGaw and I, with three Indians and Robert Saunders, set out on foot for the Gander river, intending to camp in a good hunting country that I had discovered in 1903. My plan was to shoot, if possible, two or three stags on the way and in the route of the oncoming packers, and thus supply them with fresh meat during their arduous undertaking. This we



MOUNT CORMACK FROM PIPESTONE LAKE.

succeeded in doing at suitable intervals of distance, and accomplished the march in three days, going hard all the time.

Soon after leaving Dog pond on September 17, we found that which we had most earnestly desired, namely, a stream flowing eastwards into the first of the lakes, which I took the liberty of naming McGaw's lake, after my industrious companion. By following this small brook back to its source, we can claim to have discovered the source of the Gander, the second largest river in Newfoundland, for the water system continues through the small lake chain to the eastward, and may be said to be a continuation of the main river, which had only been surveyed (by Howley) as far as Burnt hill. The actual source of the Gander comes from a small still pool surrounded by stunted spruces, and McGaw took an excellent photograph, which is here reproduced (see p. 391).

To the south of Lake McGaw we ascended to the summit of Partridgeberry hill, the highest mountain in Central Newfoundland, and obtained a magnificent view in all directions. The air was so rarefied that it was possible to make out Mount Peyton, or Blue hill, as it is called by the Indians, 70 miles away to the east. To the north Mount Lawrence and Joe Migwell's hill stood out by themselves. The great valley of the Gander lay at our feet, and we could trace its sinuous course for 20 miles from its source, through the lakes of McGaw and Rocky pond, to the widening "Steadies," beneath Burnt hill, 8 miles to the east, where it was lost in the green woods. All around us were rocky barrens and small marshes, across which countless caribou trails led away to the south, for this is a great migration route of the deer when they begin to travel. We continued all day eastwards, reaching Burnt hill at sunset. Beneath the mountain we flung ourselves wearily on the ground amongst the abundant blueberries, and thought of camping, when one of the Indians saw a stag right on the top of Burnt hill. Joe released from his pack was like a greyhound loosed from the slip, and the way he led me up that mountain after a 20-mile walk I shall not easily forget. However, I slew the stag, and we returned to the small woods, where we found McGaw had made a comfortable camp. The next day, September 18, we continued our journey over hard ground, and at midday McGaw killed his first stag, in a position that it could be easily utilized by our packers. That night we made the edge of the green timber, and camped close to a splendid beaver colony, whose occupants seemed to recognize the fact that they were protected, for they stared at their visitors with no unfriendly eyes.

The next day we journeyed down the ever-widening river, and at mid-day I killed another stag, and in the evening we reached the spot which had been my highest camp in 1903.

On the following day the Indians and Bob left us to our own devices, and returned to meet and help the packers, whilst McGaw and I hunted on the Gander for five days, and awaited the coming of the packers. During this period we killed three nice heads. On the night of the 24th the men turned up with the outfit. They had met with no accidents, but had experienced an arduous journey for eight days since leaving Dog pond. The river itself had proved nothing but a series of shallows and rocky benches, in which it was unsafe to drag the canoes, so that the men had been forced to pack nearly the whole distance. The three stags had been of great comfort to them. They had devoured the whole of the edible parts, and this had given strength to do the work.

As my friend McGaw had only one more stag to kill under the terms of his licence, and was also anxious to catch an early steamer for home, he left me on September 25, and, travelling down the swollen Gander, reached Glenwood on October 2.

I now set to work for eleven days to hunt seriously for big heads, and to explore the nature of the country westwards as far as Great Rattling brook, and southwards in the angle formed by the junction of the Little Gull river and the Gander on one side, and Great Gull river and the Middle ridge on the other, working as far east as Serpentine peak. This area is practically unknown, and in it I found a small chain of four uncharted lakes, connected by a small stream, which joins the Little Gull about a mile from its debouchment into the Gander. Both the Little and Great Gull rivers start from two lakes situated within half a mile of one another under the western edge of the range known

THE SOURCE OF THE GANDER.

(*Photo by J. McGaw, Esq.*)

as the Middle ridge, the former flowing north and the latter north-east, where it joins the Gander about 3 miles below Rolling falls. In this angle formed by the starting-point of the two rivers rises a hill known to the Indians as Berry hill. The course of the Little Gull is short and swift, and after the first mile from the Gander it is exceedingly rocky, and would be difficult, but not impossible, to explore in canoes if there was plenty of water. The Great Gull pursues a more even course through a beautiful wooded valley, and on its lower reaches there are many "steadies."

The great outcrop of serpentine rocks known as Serpentine hills is a curious formation, and seems to give promise of mineral wealth, but so far the only two prospectors who have visited it have met with

disappointment. Walking eastward from Serpentine peak one day, I found a good sheet of water named Harvey's lake, between Child's pond and the Great Gull. This connects with the Gander about a mile above the confluence of the Great Gull. I spent two days at Migwell's brook, so as to visit the ponds from which the stream is said to take its origin, and found that at a distance of 5 miles from the Gander, the brook branched and came from two small ponds half a mile apart. A similar origin takes place in the stream known to the Indians as Rolling brook, which enters the Gander at Rolling falls. From this point out to Glenwood the river and its environs are fully mapped, so that I need say no more. The weather breaking on October 10, I made for Glenwood, which I reached on October 14, after a very delightful trip across Newfoundland from the south to the east coast, a journey which has only previously been accomplished by one white man.*

REPORT OF THE INDIAN SURVEY COMMITTEE, 1904–1905.

It is no secret that the members of the Indian Survey Committee were not altogether in agreement as to the methods on which the proposed departmental reforms were to be carried out, but the general character and scope of those reforms seem to have offered no difficulty in principle, and they do not differ very widely from previous suggestions made to the Indian Government on more than one occasion within the last fifteen years or so.

The recurrent process of starving the Survey Department in order to meet treasury demands in times of financial pressure had resulted in inefficiency of service both in the field and in office. Whilst the demand for maps has been steadily increasing from year to year, the power to produce those maps had been decreasing both in men and money. Old mapping that was in need of revision was set aside or patched by the crude efforts of untrained employees, working under the local civil administration, with disastrous results; and the military mapping of the frontier, from the Indus to Persia, was confided to one working party with two military officers for its guidance.

The results of the committee's recommendations are mainly the strengthening of the department in all that appertains to the topographical or military mapping of India, and the separation of that branch of surveying from the cadastral or revenue surveys which are henceforth to be undertaken by local civil administrations, but will be under properly trained supervision from the central department. The

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* A miner named Guzman left Despair Bay in 1873, under the guidance of Nicholas Jeddore, a Micmac Indian, and reached Glenwood by this route.

necessity for an accurate geodetic basis for all surveys is not lost sight of, and this, with much cognate scientific work demanding the close attention of specialists and experts, will probably retain the position which it has always held in the curriculum of the department; only now it will be secondary in importance to the one paramount necessity for maintaining a complete and thoroughly up-to-date one-inch map of all India, and of all the frontier within the Indian political sphere of influence. In short, military considerations predominate, and the committee's recommendations, on the whole, seem well adapted to meet military requirements. So long ago as 1876 a Secretary of State for India pointed out to the then Indian Government the fallacy of expecting to effect economies by the reduction of survey establishments which had cost much in the training, and which could not be replaced again for years. Nevertheless that fallacy was supported by that Indian Government, and it has found supporters ever since. The opportunity of paying rather expensively for the luxury of maintaining it has now come. Instead of one frontier survey party and two officers to deal with all the vast extent of the Indian borderland (as well as with much that lies beyond it), there are to be five such parties with three officers attached to each; and the superintendent of frontier surveys is to hold an administrative position equalling that of the superintendent of trigonometrical surveys. The headquarters of frontier mapping is to be at Simla, in close touch with the Intelligence branch of the Quarter-master General's department, as, indeed, it used to be some years ago. Why that useful arrangement was ever disturbed it is difficult to say. It is clear that the influence of Lord Kitchener (himself a surveyor) has been strongly exercised in favour of a complete knowledge of frontier geography.

It only remains now to ensure that the improved and extended maps of the frontier find their way into the right hands. The distribution of information is no less important than its acquisition. Hitherto it has been held sufficient that the sources of information should be all gathered in at one fountain-head, with little or no outflow into the thirsty regions of the frontier. Officers commanding frontier stations were often lamentably ignorant of their own immediate geographical surroundings. This, however, is a branch of the subject with which the committee did not deal.

A most useful innovation is the increase in the number of officers who will pass through the practical survey school owing to the limitation of the period during which they will serve in the department. This promises well in future for the distribution of a large number of comparatively young officers throughout the Indian army who will have learnt the art of topography in the best of all practical fields. Probably there will be found hereafter in the ranks of the Intelligence Branch a few skilled topographers who really know how to make a map as well as how to use it. They have been long wanted.

The committee deals carefully with the all-important question of map-reproduction, but it cannot be said that their recommendations under this head are more than tentative. It may be that the partial engraving of maps and the introduction of heliozincography to replace the useful but crude processes of photozincography, will go some way towards the improvement of Indian mapping. The original field sheets are often works that would rank high anywhere in the artistic world of "black and white." They are not infrequently almost perfect expressions in pen and ink of the physical features which they illustrate. But from the hands of the printer they emerge in crude unfinished-looking sheets which might well lead to an impression of absolute inaccuracy. Nor is this necessarily the fault of the printer. Climate, material, and economy are against him—especially economy. You cannot get, in Calcutta, maps equal to the best class of English cartography at less than one-half the cost of the latter. If the immense mass of Calcutta reproductions is balanced against the attenuated office staff (European and native) that are responsible for it, it would probably be found that Calcutta is the cheapest reproducing office in the world. Nevertheless, when all is said, the conditions of climate will still remain prohibitive to the best class of map-reproduction.

A list of the chief recommendations of the committee is appended.

(1) Immediate preparation of a one-inch map of India.

(2) The number of topographical parties to be fixed at fifteen.

(3) Special arrangements to be made to complete the work required near the North-West Frontier within the next six years.

(4) Cadastral and other large-scale surveys to be left entirely to the local authorities, and the cost of all special forest surveys to be debited to the Forest Department.

(5) The question of handing over tidal work to the local authorities to be considered.

(6) Deputy surveyor-general to be given an assistant, and the post of assistant surveyor-general in charge of the Survey Office to disappear.

(7) The surveyor-general to be allowed an inspecting officer.

(8) Surveys beyond the frontier to be placed directly under a superintendent of frontier surveys occupying a position similar to that of the superintendent of trigonometrical surveys.

(9) The post of superintendent of forest surveys to lapse.

(10) The trigonometrical branch to be strengthened by two officers.

(11) The strength of the field parties to be increased fifty per cent.

(12) Each ordinary topographical party to have two officers, one in charge and the other to be his assistant, and frontier parties to have three officers.

(13) To meet these proposals the strength of Imperial Service for topographical and trigonometrical work to be increased from forty to seventy officers.

(14) First appointments of army officers to the Imperial Service to be for five years, and a language test to be imposed.

(15) The Provincial Service to be divided into two services, a Provincial, or Indian, Service, and a Junior Service, the pay of the former to range from 250 rs. to 800 rs., and that of the latter from 80 rs. to 400 rs., and some modifications in recruiting to be introduced.

(16) Indians to be employed in a certain proportion of the Provincial and Junior Services.

(17) Imperial and provincial officers employed on cadastral or similar work to be seconded, and their places filled in the department.

(18) An additional officer to be appointed as an assistant to the officer in charge of the photographic and lithographic office, the two to then include the mathematical office in their charge.

(19) Local governments to reproduce their own cadastral maps, and no drawing of extra departmental work to be thrown upon the Survey of India Office.

(20) The question of the removal of headquarters from Calcutta to be postponed for the present.

T. H. H.

REVIEWS.

ASIA.

Turkestan and Persia.

'Explorations in Turkestan, with an Account of the Basin of Eastern Persia and Sistan.' Expedition of 1903, under the direction of Raphael Pumpelly. 4to. Washington: 1905. *Maps and Illustrations.*

This work, a massive volume of 324 quarto pages, excellently illustrated with maps, photographs, plates, and diagrams, forms a most valuable contribution to geographical science. It is published by the Carnegie Institute of Washington, and records the geographical work of an expedition sent out by that institute in 1903, under the direction of Mr. Pumpelly, "for the purpose of making a preliminary examination of the Trans-Caspian region, and of collecting and arranging all available existing information necessary in organizing the further investigation of the past and present physico-geographical conditions and archæological remains of the region." The reasons for selecting this particular field for research are stated to be—(1) The existence of a school that still holds the belief that Central Asia is the region in which the great civilizations of the Far East and of the West had their origins; (2) the supposed occurrence in that region in prehistoric times of great changes in climate, resulting in the formation and recession of an extensive Asian Mediterranean, of which the Aral, Caspian, and Black seas are the principal remnants.

The party consisted of Mr. Raphael Pumpelly, with Mr. R. W. Pumpelly as his assistant; Prof. William M. Davis, Sturgess Hooper professor of geology Harvard University; and Mr. Ellsworth Huntington, Carnegie research assistant. Each of the above has contributed separate portions of the volume. The space at disposal is inadequate for more than a brief reference to each.

Mr. Raphael Pumpelly himself furnishes a paper on "Archæological and Physico-Geographical Reconnaissance in Turkestan," in which he states the purposes of the

expedition, sums up the conclusions arrived at by each member of his party, and propounds recommendations regarding the scope of future investigations. He does not appear to have done much individual research in this expedition, but his remarks on such personal observations as he made of the old tumuli and sites of ruined towns are very interesting.

Prof. Davis's contribution is styled "A Journey across Turkestan," and records observations made on a journey from the Caspian to Askhabad, the Kopet Dagh mountains, Merv, Samarkand, Tashkent, Andijhan, across the Tian Shan mountains to Lake Issik-kul, and thence homewards *viâ* Vyernji and Omsk to St. Petersburg. The time spent in Turkestan was from May to August, *i.e.* three months. From an authority of wide-world renown such as Prof. Davis we naturally expect observations and conclusions of great interest and value, and these expectations are here fully realized.

Mr. R. W. Pumpelly contributes "Physio-geographical Observations between the Syr Darya and Lake Kara-kul on the Pamir," wherein is recorded observations made on his journey from Osk *viâ* the Kizil Art pass to Kara-kul and back, June 23 to July 17.

To Mr. Ellsworth Huntington we are indebted for not only two, but the two largest portions of the volume. The first, "A Geological and Physio-graphic Reconnaissance in Central Turkestan," presents the results of a journey of two months—August and September—from the Issik-kul lake, over the Tian Shan range, to Chadir Kul and Kashgar; thence *viâ* the Terik pass to Osh, to Karategin in the Alai range, and northwards to Marghilan. The second, under the title of "The Basin of Eastern Persia and Sistan," records the observations made on a journey of three and a half months (November, 1903, to March, 1904), from Transcaspia to Seistan and back. Among the principal physical phenomena brought to notice by the above observers are the following:—

Prof. Davis reports traces of an old shore-line about 600 feet above the western shore of the Caspian sea, and a very distinctly marked one about 200 feet above the east side of the same sea. In the mountains near Issik-kul he claims to have found clear evidence of two, and probably three, glacial epochs.

Mr. Huntington, in the higher Tian Shan, found proof of three, and later in the Alai range of five, glacial epochs, between some of which there were long interglacial intervals. He reports records of climatic oscillations, shown not only in moraines, but in valley terraces, and considers these to be members of a group of sympathetic glacial phenomena.

Prof. Davis has noted in the Kopet Dagh and eastern mountains evidence of longitudinal dislocation accompanied by great block uplifts, formed apparently after the wearing down of the mountain masses to a peneplain, and preceding an active dissection of the elevated mass.

Mr. R. W. Pumpelly reports evidence in the Alai of a block uplift, followed by a block tilt, both with a dislocation to the north. He correlates these movements with the glacial geology, making the block tilt an interglacial event.

The conclusions finally arrived at by the expedition as a whole are, that the recent physical history of the region is legibly recorded in glacial sculpture and moraines, in orogenic movements, in valley-cutting and terracings, in lake expansions, and in the building up of the plains, and that progress has been made in correlating these events, inasmuch as the block uplifting and tilting have been correlated with the growth of the Fergana lowlands, and the relation of the glacial expansions to the valley-cuttings in the Trans-Alai range has been clearly recorded. Full information is claimed to have been found of a progressive desiccation of the region from a remote period. Abandoned sites, great and small, of human

occupation, evidently of great antiquity, have been found widely distributed, and it is concluded that a correlation of these physical and human events may be obtained through a continuance of the investigation, and that archæological excavations will throw light on the origin of Western and Eastern civilizations.

The above brief sketch of the work and records of the party under Mr. Pumpelly will suffice to bring to notice a remarkable advance in the scientific treatment of the physico-geographical problems of a country. However virgin a field of research Turkestan may be, one cannot but be greatly impressed by the mass of new information collected and recorded by the present expedition in the making of what is claimed to be but a preliminary reconnaissance of the country. If so much has been done by systematic and scientific observation in journeys of such short duration, we are indeed justified in expecting important results from further and prolonged exploration conducted under the same scientific system. It is, however, only reasonable to expect that some at least of the conclusions now formulated will be modified by further research.

The geographical world will look with interest for the records of further work by these same authors, and it is greatly to be hoped that other geographical communities may be tempted to conduct physico-geographical research on the advanced scientific principles adopted by the Carnegie Institute.

A. H. M.

AFRICA.

The Masai.

'The Masai: their Language and Folklore.' By A. C. Hollis, with introduction by Sir Charles Eliot. Oxford: 1905.

None of the Central African peoples revealed to the outer world during the latter half of the nineteenth century have received more careful and adequate treatment than the Masai nomads, whose outstanding physical and mental characters, social and military institutions, religious notions and traditions could not fail from the first to attract the attention of anthropological students. The graphic picture presented by Joseph Thomson's 'Masailand' has been greatly enlarged by Merker's 'Die Masai,' lately noticed in the *Journal*, and is now all but completed by the present work, the value of which is not a little enhanced by Sir Charles Eliot's comprehensive survey of the whole field. This is all the more timely since the people themselves are, under various adverse circumstances—rinderpest, small-pox, famine—steadily declining, their numbers having in recent years fallen from perhaps 50,000 to scarcely more than 12,000 in the British section of their former domain. It was, in fact, this threatened extinction or fusion of the race in the surrounding Bantu populations that inspired the present work, in which Mr. Hollis has sought, before it was too late, to give a full account of the language, "the customs and beliefs of this interesting people, all given in the words of the relaters themselves." The result is most satisfactory, and Sir Charles Eliot is fully justified in declaring that the book is one of the most valuable contributions yet made to the anthropology and philology of British East Africa.

Sir H. Johnston's suggestion that the Masai are an early blend of Nilotic Negroes and Galla and Somali Hamites is here accepted as probably correct. This view at once explains the curious intermingling of Negro and Caucasic physical characters that has been noticed by all observers, and at the same time accounts for the peculiar structure of the Masai language, whose affinities are here shown to be with the Bari, the Latuka, and other Nilotic tongues, and not at all with

the Hamitic family. The inference is obvious that the substratum is negro, while in the process of somatic fusion there has been no linguistic fusion, but one of the two rival languages has simply perished, in accordance with the principle always insisted on by me that, while all races normally intermingle, there is no true linguistic miscegenation ('Ethnology,' ch. ix.).

In his treatment of the Masai language, Mr. Hollis has adopted a highly practical method, by which the laws regulating the formative and other structural elements are stated in the fewest possible words, and then illustrated by copious examples. The rigid and unnatural distinction drawn in most grammars between accidence and syntax is thus got rid of with excellent results, and without any sacrifice of clearness. Since the sentence, and not the word, is the true unit of speech (Sayce), it must be obvious that this is the real scientific method, and the student will be all the more grateful to Mr. Hollis for having extended it to the whole of the volume. The numerous Masai texts, comprising cosmic myths, moral and religious tales, folklore stories, proverbs, riddles with their answers, and the like, are generally given with interlinear verbatim translations, and then followed by free English versions, so that this second and larger section of the volume serves as a continuous application of the grammatical rules occupying the first part. Some of the tales and wise saws bespeak a people gifted with a fair share of natural intelligence, and far from destitute of a measure of moral sense fully adequate to the maintenance of their by no means primitive social conditions. Thus "the night has ears" = our "walls have ears;" "the charcoal laughs at the ashes" = "hodie mihi cras tibi," or "your turn next;" "the arrows come by the hind-leg," *i.e.* if arrows come, there are foes behind them, = "no smoke without fire;" "we begin foolishly and end wisely" = "experientia docet." And here is just one riddle—What escapes the prairie fire? The bare spot (where no grass grows).

A. H. KEANE.

THE WESTERN SUDAN AND NIGERIA.

'A Tropical Dependency: An Outline of the Ancient History of the Western Soudan, with an Account of the Modern Settlement of Northern Nigeria.' By Flora L. Shaw (Lady Lugard). London: Nisbet. 1905. Pp. viii. + 508.

Miss Shaw, now Lady Lugard, will long be remembered as the brilliant correspondent of the *Times* on Colonial affairs. To the composition of this more solid piece of work she has brought to bear the same remarkable qualities—thorough grasp of the subject, clearness of exposition, and an easy fluent style—which made her Articles such pleasant and instructive reading. To these has here been added an unwearied industry in the collection and discriminating study of the copious materials which had to be consulted in the preparation of the present work, which covers an immensely wide field, far wider even than might be gathered from its rather full explanatory sub-title. This will at once be seen when it is stated that the 'Outline' is by no means confined to the 'Western Soudan,' but ranges over the whole of North-West Africa and Spain, thus enabling the gifted writer to deal intelligently with the manifold relations which Arabs, Berbers, and Europeans have had with the Negro and Negroid peoples between the Atlantic and Lake Chad throughout the historic period. It is a tremendous programme, and the wonder is that the author did not break down under the weight of her self-imposed burden. Within the elastic framework of this kaleidoscopic picture are comprised such varied and often obscure topics as the spread of Islam throughout North Africa and Iberia; Arab and Berber political and cultural supremacy in Spain; the successive rise and fall of the strictly Sudanese empires of Ghana, Melle, the Songhay, Hausas, Fulahs, Kanembu, and Kanuri (Bornuans); possible early

Egyptian (Pharaonic) influences in the Hausa lands; Europe in West Africa; European and local slave trade, slave raiding, and domestic slavery; the Royal Niger Company; Northern Nigeria, its settlement, economic relations, and prospects.

Uniform excellence in the treatment of such diverse subjects was not to be expected, and it will perhaps be generally felt that the book would have been all the better for a little pruning. Certainly those sections dealing with the shadowy Egyptian relations had better have been omitted, and here, I think, too much confidence has been placed in M. de Lauture's rather wild speculations regarding Asiatic traditions, and in M. F. Dubois' still wilder theories about Pharaonic invasions and settlements in Western Sudan. The *Ungaras*, "of whom many were Fulani," are associated with the Indian epic of the Ramayana, because of a Raja of *Ungar*, which "must have been a province of Persia," while the origin of the Fulani themselves must also "be sought in India (de Lauture), although they had previously been identified with the Arabian Wahabi (Denham). Nor is Heeren quite a safe guide, besides being a little out of date.

But with this and one or two other reservations on secondary matters, the rest of the volume, say nine-tenths of the whole, dealing also with those questions for which it will be mainly consulted, must be spoken of in language of unstinted praise; and this applies in a special manner to those instructive and eminently readable chapters which deal with all the native empires, with the overthrow of the Askian dynasty (Songhay) by the Hispano-Moroccan "Moors," with the overthrow of the Fulah emirs by the British, and with the resultant settlement of Northern Nigeria. In this last section there is a pleasant note of reasoned optimism, which ensures the sympathy of those at least who "think imperially," while at the same time conveying a well-earned tribute of recognition to Sir George Goldie, her husband Sir Frederick Lugard, and the other officials engaged in the rough and too often thankless pioneer work of empire-building in Central Africa. The staff, she remarks in one place, "was chiefly composed of that fine type of young Englishmen who, whether as soldiers or civilians, have it in their minds to serve their country to the best of their ability, in some adventurous capacity which will take them out of the common round of comfortable life. Their experience of Africa was mostly *nil*, but they had the training of the public school, the army, and the university, which fits men equally for the assumption of responsibility and for loyal subordination to authority. They were ready to go anywhere and to do anything, and . . . represented, in the eyes of the High Commissioner, the very best stuff of which the English nation is made."

An agreeable feature of Lady Lugard's style is the terse and epigrammatic way in which general conclusions are often summed up, which adds not a little to the charm of the work. After the capture of Kano and Sokoto, she writes, "The trial of strength had come and gone. The Fulani emirates were in our hands, and Great Britain was the acknowledged sovereign of Northern Nigeria." The political change suddenly brought about in a region several hundred thousand square miles in extent, with a population of many millions, is thus adequately stated in three lines. Again, after pointing out the wasteful character of transport by human agency, she adds, "Human carriage is a concomitant of slavery. With the abolition of slavery it becomes impossible." And reference is made in the same succinct way to the wise policy of ruling, "as far as possible, through the existing Fulani and Bornuese machinery, modified and controlled by the advice of British residents." Here is revealed in a few words the secret of the astonishing ease and rapidity with which the *pax Britannica* has been securely established throughout this great "tropical dependency."

Owing, evidently, to the frequent use of French documents, a faulty orthographic

system somewhat disfigures the text, though it has fortunately not ranged into the two large and most accurate maps supplied by Mr. Stanford. Thus we have Soudan and Sudan, Timbuctoo and Timbuktu, Audoghast for Audaghost (Barth), Cairouan for Kairwan, and other irregularities which should disappear in future editions. Then, also, the short index might be usefully enlarged.

A. H. Keane.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Practical Astronomy.

'Handbuch der Geographischen Ortsbestimmung für Geographen und Forschungsreisende.' Von Dr. Adolf Marcuse (Privatdozent an der Universität Berlin). Mit 54 in den Text eingedruckten Abbildungen und 2 Sternkarten. Braunschweig: Druck und Verlag von Friedrich Vieweg und Sohn. 1905. *Price* 10 *Marks*.

Notwithstanding the rapid extension of surveys based upon triangulation, there are still many regions of the Earth where it would be impossible to obtain accurately fixed points for commencing a survey, and where consequently a geographical surveyor would have to depend upon his own astronomical observations for the determination of his initial positions. Hence it is most important that he should previously make a thorough study of the methods best suited for this purpose, and to that end such a work as Dr. A. Marcuse, of Berlin, has just published should prove of great assistance to him. It is true that many books of a somewhat similar character have appeared in recent years, but there are in this some special features that should recommend it to geographical surveyors and students of mathematical geography generally. It is essentially a book for students, and although it contains examples of the ordinary astronomical observations for the determining of latitude, longitude, and azimuth, it is more suitable for previous study than for actual practical work in the field. The methods described for the determination of latitude are for the most part those in general use, but the longitude observation from altitudes of the moon has of late years been practically discarded in this country on account of its unsatisfactory results. With larger and more exact instruments than those usually carried by travellers better results might doubtless be obtained, specially when the observations are properly balanced; but even then, and after the necessary corrections have been applied to the lunar tables, it is doubtful if the results of the observations would justify the time and labour spent upon them. With the exception of the occultation of a star, the methods of obtaining longitude which depend upon the moon's motion must be considered far too unreliable for the present time, and the character of work now required

In the section of Dr. Marcuse's book entitled "Rechnerische Hilfsmittel zur Geographischen Ortsbestimmung" is given a brief description and summary of contents of the principal nautical almanacs and ephemides of different nations, as well as of various logarithmic and other tables arranged to assist in the computation of the observations.

In the third part of the book will be found a more than usually complete account of the principal instruments used in practical astronomy, with excellent illustrations. The description of the chronometer given here is specially good, as is also that of the various angular measuring instruments and levels.

Towards the end is given a chapter on the approximate computation of observations by means of Mercator functions (or meridional parts), another on methods of determining the position in aero-nautical navigation, and a third on rough methods of observation without angular measuring instruments. There are also

two star maps, one of the northern and the other of the southern constellations; but these have little to commend them, except that they are free from the grotesque figures representing the constellations which used too frequently to obscure such maps.

The Geography of Earthquakes.

'F. de Montessus de Ballore: Les Tremblements de Terre.' Géographie Sismologique, Avec un Préface par M. A. de Lapparent. Pp. v + 475, 3 *maps*, 89 *figures in text*. Paris: Armund Colin. 1906.

For years past the author of this work has poured forth a copious stream of memoirs, dealing with the distribution of earthquakes in one country after another, and now we have the coping stone of the edifice. Inspired by no mere love of statistics for their own sake, Comte de Montessus has left to others the study of the nature and effects of earthquakes, and has attempted, by a study of their distribution in space and time, to reach their cause, but as geographers are more concerned with the distribution of earthquakes, we may be pardoned for attaching greater importance to the means than to the aim of our author's researches, and in this connection he has brought out one noteworthy point—that nine-tenths of the whole number of earthquakes originate along certain narrow bands. Most conspicuous of these narrow bands, along which most of the seismic areas are distributed, is that which commences in the western Mediterranean and extends through the Alps, Caucasus, and Himalayas to Arracan, a continuation being seen in Java and Sumatra; from the southern end of the Caspian it sends out an offshoot running up into the Kuenlun mountains, and two isolated patches, one round Lake Baikal, the other in Central China, complete the seismic districts of Asia. Outside Asia proper comes the great girdle of the Pacific, running from Borneo through the Philippines, Japan, the Kurile and Aleutian islands to Alaska; it becomes interrupted along the western coast of North America, though California is classed as seismic, as is the western part of Central America and the west coast of South America. An offshoot from this land runs into the Antilles and possibly beneath the Atlantic, where submarine earthquakes are known to occur with some frequency, to the western end of the Mediterranean band. Outlying seismic districts are, New Zealand, which may form a portion of the Pacific girdle, Florida, the Indus delta, the hills of Madagascar and Central Abyssinia; with the exception of the coast districts of Morocco and Algiers, this is the only seismic district in Africa, a continent which is, as a whole, peneseismic or aseismic. When the smallness of these areas is considered, forming apparently not more than one or two per cent. of the whole surface of the globe, the large proportion of earthquakes originating from them is remarkable, and may be expressed by saying that earthquakes are frequent and severe in those regions where great tectonic changes have recently taken place, and are less frequent in proportion as these are of earlier date and have more or less completely died out.

R. D. O.

GENERAL.

Life of Alfred Russel Wallace.

'My Life: A Record of Events and Opinions.' By Alfred Russel Wallace. Large 8vo. 2 vols., pp. 435 and 459. *Map, Portraits, and Illustrations.* London: Chapman & Hall. 1905.

In recording his impressions of a tour in Switzerland, the veteran zoologist, whose two large volumes of autobiography lie before us, thus expresses himself:

"The appreciation of Nature grows with years, and I feel to-day more deeply than ever its mystery and its charms." Some might therefore look in the life-story of the writer who gave us 'The Malay Archipelago' and the essays on 'Tropical Nature' for a more apparent manifestation of such appreciation than is here to be found—a perceptible undercurrent of recognition, as it were, of what a recent writer has termed "the call of the wild." But probably we have no right to complain of the fare provided. Dr. Wallace had many interests besides those of science, and he was right not to go over the ground already traversed in his published books and papers, which are quite accessible.

In the earlier part of the work we have a long excursus on Robert Owen's work in New Lanark, and a whole chapter upon Jack Mytton, with whom the author was not even contemporary; while later there is a good deal which scarcely touches on the author's life, such, for example, as the answers, amusing enough though they may be, for which the British schoolboy is responsible while under examination. Other subjects there are, too, interesting, no doubt, in themselves, such as land-nationalization and mesmerism, which occupy even more space. But we must here confine our notice to those parts of the work which fall more legitimately within our scope.

It is a significant fact that Dr. Wallace found geography one of the most painful subjects he was ever called upon to master at school. No interesting details concerning the countries were ever taught him, he says, and no good maps ever shown—"nothing but a horrid stream of unintelligible place-names." An interest in countries and places unknown to him, and some knowledge of topographical geography, were nevertheless gained by dissected maps of Europe and England, which were among his toys—a point which teachers in geography would do well to lay to heart. For the most part, however, he had to make his own toys, thereby acquiring a manual dexterity which stood him in good stead in his travel days, scarcely less, indeed, than did his early experiences as a land surveyor.

Most persons destined to make a name for themselves as naturalists give early evidences of their tastes, and begin collecting as children. Dr. Wallace reached the age of eighteen apparently before he gave more than a casual thought to bird, or beast, or flower; and this notwithstanding that his work perforce led him to the fields and hedgerows. Curious indeed is the story of how, almost suddenly, he came to develop an interest in plants, and how the mere description, not the sight, of *Dendrobium devonianum*—certainly one of the most fairy-like of orchids—first aroused in him a wish to visit the tropics, combined with his reading of Humboldt's 'Personal Narrative.' Malthus's 'Principles,' which came into his hands about this time, was the source, he considers, whence twenty years later he obtained the long-sought clue to the effective agent in the evolution of species.

While schoolmastering in Leicester in the year 1844, the author first met Bates, and the study of the latter's collection of beetles drew his attention to another branch of natural history, and ultimately brought about the Amazon journey. But it is remarkable that before this, and when he had been interesting himself but a very short time—not more than four years—in natural science, he had already begun to speculate upon the origin of species. The Amazon journey is dismissed in a single chapter, and the long years spent in the Malay archipelago in two. Dr. Wallace no doubt thinks, and rightly, that his previously published accounts are sufficient. With these outlines, then, we come to the second volume, which opens with what is practically the most important chapter in the book. It bears the name of Darwin at its head, and gives some unpublished letters of the latter, but most of the ground is, of course, covered by the "Life and Letters,"

and there is but little that is new to the student of the history of the hypothesis which we now talk of as Darwinism. Dr. Wallace carefully sums up the differences between his own theories and those of his fellow-discoverers; and, indeed, not the least interesting part of the book is where he discusses his impressions of Huxley, Darwin, Herbert Spencer, and others of the band of great scientific thinkers of whom he is now the sole survivor.

After a rather lengthy account of a tour in America, we pass beyond the domain of geography, and are led *viâ* land-nationalization to socialism, and thence to spiritualism and antivaccination, whither we need not follow. At first we may feel a shade of regret that we cannot exchange these subjects for others more germane to the sciences to which the author was so distinguished a contributor, but perhaps it is better so. Out of the abundance of the heart the mouth speaketh, and the autobiography would lose its value as a human document were the author's own perspective to be disregarded. Dr. Wallace's volumes are of very real interest, it is needless to say, to the philosopher and the political economist as well as to the zoologist and to the geographer.

THE MONTHLY RECORD.

EUROPE.

France and the Simplon Route.—In view of the approaching opening to public traffic, on June 1 next, of the Simplon tunnel route, the discussions on the steps to be taken to bring the French railway system into relation with the new international route continue to be maintained with much vigour. As is well known, the idea of a direct route across the Jura by the Faucille has found strong partisans, both in France and Switzerland, while others are equally strongly opposed to the scheme. The latest contribution on the part of the opponents of the Faucille route is a paper by Prof. Brunhes, of Fribourg, in the *Revue Economique Internationale* for February, 1906 (also reprinted as a brochure). Prof. Brunhes is well known as a writer on economic geography, and he puts the case against the Faucille scheme with much force, and, in the absence of a counter-statement by the supporters of the scheme, in a convincing manner. The paper is illustrated by maps, which help to bring the salient facts in the question strikingly before the eye. Having touched upon the desirability of bringing France and the French-speaking part of Switzerland into closer relation, he maintains that from every point of view the route *viâ* Vallorbe and Lausanne (the shortening of which by a tunnel through the Mont d'Or, between Frasne and Vallorbe, was provided for by an agreement between France and Switzerland in 1902) has the advantage over that by the Faucille and Geneva. Not only would the cost of the first-named scheme be incomparably less—as it requires only one tunnel of 6225 metres instead of three, each of greater length, and one of them longer than either the St. Gothard or Mont Cenis—but the actual distance involved in the through journey from Paris to Milan would be 40 kilometres (25 miles) shorter, or 17 kilometres (about 10 miles) even without the proposed improvements by the Mont d'Or. It has been maintained that the gradients, etc., on the Vallorbe line would be such as to unfit it to serve as an international route, but Prof. Brunhes points out that, although somewhat greater than on the proposed Faucille line, they are still far less serious than those on the Simplon line, to say nothing of the St. Gothard and Mont Cenis. As to the extent of French territory which would be served by the Faucille route, he

holds that the statements which have been made are thoroughly illusory, for even were the Faucille line made, the greater part of the traffic from northern and western France would still go by the shorter routes to the north and south of it. Still another objection to the Faucille route would be the necessity, in order to avoid the *détour* by the north shore of the Lake of Geneva, of a connection between the two French lines approaching Geneva from opposite sides, the supply of which would be a matter of great, if not insuperable, difficulty. Meanwhile the existing Vallorbe line will certainly be used for through traffic from France to the Simplon, and the people of Geneva are already agitating for an express service to Paris by the line connecting with the same route west of Lausanne.

Remains of Wends in Mecklenberg.—A monograph by Dr. Hans Witte, keeper of the archives of the Grand Duchy of Schwerin, recently published as a part of the *Forschungen zur deutschen Landes- u. Volkskunde* (vol. 16, No. 2), traces the remains of Wendish population in Mecklenberg. Before 1160 East Elbeland was completely Wendish. In the second half of the thirteenth century it was apparently completely German. It may be thought that this sudden change was brought about by the German migration and the consequent war of extermination. But was the extermination of the Wends complete to the letter? Three accounts are cited. One assumes that the Slavs of East Elbeland were a race of rulers imposed on a pre-existing German population, and that, like the Franks, Goths, and Lombards, the Slav rulers gradually adopted the nationality of the subject race. In face of the overwhelming documentary proof of a Wendish occupation of the region, this view is summarily dismissed. For instance, in the charter of the cloister of Dargun (1174), the frontier places enumerated are pronouncedly Slavonic. The names of places in the Schwerin bishopric, 1178, are exclusively Slavonic, and all the evidence points to the same conclusion. An opposite view is that not only down to Henry the Lion was there a purely Slavonic population, but that they survived the war of races, and that the East Elbians are still in the main German-speaking Slavs. The German immigration in the middle of the twelfth century, and the terrible thinning of the native Wends, seems, however, altogether beyond dispute. A third view recognizes, after the complete subjugation of the Slavs, a veritable war of extinction. Denied German rights and Germanization, the Slavs were driven wholesale from their soil, which was then converted into German settlements. An event of such historic importance, as also of much geographical significance, seems now in a way to be conclusively settled. Dr. Witte has ransacked the Ratzeburg tithe-register of 1230, as well as the huge volumes of Mecklenburg documents. His investigations include in their scope Slav remains in the Ratzeburg see according to documents of later date than the register; evidence of Slav settlement in Eastern Mecklenburg; topographic and personal nomenclature; peculiar construction of Slav settlements. Again, wherever a division of fields by hides is found in operation, there a preponderant German element is to be inferred. The division by "Hakenhufen," a measure of 15 acres, on the other hand, is characteristically Wendish, and wherever found in operation, the existence of a preponderant Wendish element is to be inferred. A map is given at the end of the paper, on which are graphically shown (*inter alia*): (1) Places with Slav population and the frontier of a continuous Slav territory, according to the Ratzeburg register; (2) places expressly marked or implicitly denoted Slavonic, according to documents reaching to 1400; (3) places in which Slavonic family names are very prominent, a notable feature, or of occasional occurrence, according to documents dating from 1401–1600.

The First Use of the Name "Maelstrom."—In a note on this subject in vol. 23, p. 384, it was stated that the earliest use of the name "Maelstrom" seemed to occur in Mercator's atlas of 1595, the older term "Muskoestrom" having been used

in previous maps. A still earlier use, however, is that in Waghenaer's nautical atlas of 1584–85 (*cf.* February number, p. 204), the individual map in which the term is found bearing the date 1583. This is, therefore, earlier than the occurrence in Hakluyt (1589) of the corrupted form "Malestrand," though the journey of Anthony Jenkinson, which is there described, was made in 1557. As Waghenaer was himself Dutch, the probable Dutch origin of the word still holds good.

ASIA.

Surveys in Ceylon.—The report of the Surveyor-General for 1904 shows that the total area covered by block surveys amounts since 1897 to 525,616 acres, the total area so surveyed in 1904 being 198,383 acres. Since the commencement of the work 2600½ square miles have been covered by the field staff, and 912½ square miles issued as preliminary plans for settlement purposes. During 1904 the first serious attack on the mountain zone was made by two parties, one continuing the "1-mile-to-an-inch survey," the other starting the plane-table "contour" surveys. The entire topographic survey staff was engaged in the Province of Uva, the "1-mile" section taking up the country in the north from the work already mapped. The continuation of the "1-mile" survey, carried out in 1904 by only eight surveyors, will expedite the publication of the 4-mile wall map, the present one being obsolete and very inaccurate, while the data supplied will also expedite the contour survey. A map of Ceylon, 16 miles to an inch, shows the principal and minor roads, cart tracks, railways, respective areas of topographic and block surveys, 1897–1904, as also the area under survey in 1905. Included in the interesting report are an exact reproduction from the 4-mile-to-an-inch map now available and another map, placed beside it for comparison, being a reduction to the same scale of the same area, as a result of the new survey. The new map includes bridle and foot paths, paddy-fields, estates, and gardens. There is shown a plane-table survey map, eventually to cover the whole of the mountain area, on the scale of 16 chains to an inch, with a contour interval of 25 feet, as well as a 1-mile reduction of it; a work which will determine the altitudinal distribution of different products, and the location of proposed roads and railway routes.

AFRICA.

The Seychelles.—Mr. J. Stanley Gardiner has completed his series of papers on the results of the Indian ocean expedition, which have appeared from time to time in *Nature* and have been duly referred to in the *Journal*, by an account of the Seychelles archipelago, in the exploration of which he and Mr. Cooper spent seven weeks after finally leaving the *Sealark* (*Nature*, January 25, 1906). The archipelago rises from a submarine bank of fairly regular contour, measuring about 190 miles by 100, and bordered, chiefly in its north-west half, by a rim indicated by soundings shallower than the average depth of 30 fathoms occurring over the bank as a whole. In the north there are two typical surface reefs with coral islets, Bird and Dennis, in the neighbourhood of which the character of the bottom indicates the upgrowth of a rim. Between the two islands there seems a natural outfall for tidal and other currents, and both here and on the bank itself (across which strong currents also sweep) the sea seems always cloudy and unfavourable to the growth of reefs. The main islands of the western group, Mahé and Silhouette, reach heights of 2993 and 2467 feet respectively, while Praslin and the eastern group do not exceed 1270. All the islands are formed of coarse granites (or granulitic quartzes) with dykes of finer-grained black rock along which the mountain streams have invariably cut their courses. In places there is evidence of a recent elevation of more than 30 feet, masses of coral rock being found cemented on to the granite. There are also indications, particularly in Mahé,

of an elevation of over 200 feet, and the continuous precipices on the eastern or windward side of **Mahé** may be due to previous marine action, while in any case the extensive erosion and weathering argue a considerable antiquity for the land. Barrier reefs are entirely wanting, and fringing reefs occur sparingly, the reason seeming to be the almost complete absence of nullipores, so necessary for the consolidation of corals into true reefs. Where fringing flats do occur they appear to have a granitic basis, while their surfaces are covered with a far greater variety of large seaweeds than were found in any of the purely coral groups. The boat passages through them are generally mere outfalls for the tide, and have no connection with the land-streams. Cultural operations have largely destroyed the indigenous jungle, which, where it remains, is a typical moist tropical forest, with, however, few climbing plants or herbaceous dicotyledons, while nearly all the larger trees are peculiar Seychelles species, or even genera. The cotyledonous plants are sharply distinguished into three classes—the calciphilous, the siliciphilous, and the indiferents, the last being the least abundant. The calciphilous species were found to be practically the same as those of all the coral islands visited, and appear to be ocean-carried, the Seychelles being in this respect as oceanic as any of the Chagos islands. The seeds of many of the trees could also have been brought by currents, etc. An examination of a number of the nuts of the coco-de-mer showed that they are of two structurally different forms growing in about equal proportions on the same tree. The species of land and fresh-water animals are singularly few, and the former connection of the group with any larger land-mass seems doubtful. It is, however, the continuation of a broken line extending north from Madagascar, and its rock would seem to be similar to that of the great central plateau of the latter. The soundings made on the return voyage of the *Sealark* have confirmed the complete separation of the 2000-fathom lines of the Chagos, Maldive, and Seychelles groups.

French African Territories.—By a decree dated February 15, 1906, but previously made public and printed in the *Dépêche Coloniale* for February 13, the organization of the French Congo territory has once more received modifications (cf. *Journal*, vol. **23**, p. 523). These do not greatly affect the territorial subdivision of the area, which continues to be formed of four "circonscriptions"—those of the Gabun, the middle Congo, Ubangi-Shari, and the Chad territory, which embraces practically all the French portion of the Shari basin, together with Wadai and Kanem. The Gabun, however, receives some accession of area by the incorporation of some of the coast districts which previously belonged to the middle Congo, and it now comprises all the basin of the Ogowe, with coast districts from the Spanish territory in the north to Sette Cama in the south. The third and fourth "circonscriptions" (now formed into a single "colony") retain their old limits, but are placed under the general control of a lieut.-governor, residing at Fort-de-Possel; while the Chad territory is under the immediate control of a military commandant. A map showing the territorial limits is given in the *Dépêche* for February 14. The Algerian Sahara has likewise been reorganized, by a decree of August 14, 1905, as explained in the *Revue de Géographie* for December (with map). That decree fixed the limits of the four territories of Tuggurt, Ghardaia, Ain-Sefra, and the "Saharan Oases;" the first three occupying the more northern parts of the territory in a line from east to west, while the last, with Adghar as chief centre, extends south towards the frontier with French West Africa, which is shown on the map referred to. From the neighbourhood of Ghat, in Tripoli, it makes a sweep to the south (beyond 20° N.), so as to include most of the country covered by Colonel Laperrine's route of 1904 (*Journal*, vol. **24**, p. 348; vol. **27**, p. 87), afterwards running west-north-west and passing north of Taudeni.

The Duke of the Abruzzi's Expedition to Ruwenzori.—This expedition sails from Naples on April 16. It consists of twelve Europeans: H.R.H. the Duke, Captain Cagni, Dr. Cavalli, Lieut. Winspeare, Dr. Roncati, a geologist, Signor Vittorio Sella, two alpine guides, two porters, an assistant photographer, and a cook.

AMERICA.

The South American Earthquake.—One of the destructive earthquakes which occur from time to time in the central zone of the New World, took place on January 31 last, the scene of most intense action being the western coast of Colombia and neighbouring portions of Ecuador. The details which have been published in the daily papers are not so complete as might be wished, but according to a Reuter telegram, despatched from New York on February 16, the first shock was felt in the province of Esmeraldas, Ecuador, at 10 a.m. on January 31, the disturbance continuing with short intervals until February 6, the inhabitants meanwhile living in a state of panic, and abandoning their houses for the open air. In the city of Esmeraldas various buildings collapsed, and much damage was done by a tidal wave, which inundated the principal streets, the people fleeing for the mountains. Near Port Limones four small islands are said to have disappeared, though not so suddenly as to prevent the fishermen who inhabited them from escaping in their boats. Other parts of the province shared in the devastation, which made itself felt in many Colombian towns, the damage and loss of life being apparently greatest at Mosquera, San Juan, and Domingo Ortiz, while Antioquia and other departments suffered heavily. Prof. J. Milne informs us that he obtained an excellent series of seismograms at his observatory at Shide, indicating an unusually large collapse. The instruments recorded the commencement of the disturbance at $3^h\ 47^m$ p.m. G.M.T., on January 31, the corresponding Colombian time being about $10^h\ 9^m$ a.m. One hour and fifty minutes later the large waves had reached their antipodes, disturbing on their route every seismograph constructed to record teleseismic movement, every spirit-level, agitating many magnetic needles, and producing a variety of effects only to be explained as the results of the South American convulsion. In the epifocal area islands sank and great sea-waves were created, while in Columbia the volcano of Cumbal was shaken into activity, and on February 16 severe shocks were experienced in the Antilles, walls being cracked and a cable interrupted. Prof. Milne points out that in the history of seismic disturbance in this region it is remarkable how often convulsions in the Cordillera have found a response in the West Indies. To go no further back than 1902, the great disaster at St. Pierre had been preceded by great disturbances in Guatemala. The record of cable fractures off the west coast of South America shows that the portion of the sea-floor off the mouth of the Esmeraldas river has been particularly liable to changes of contour. In his paper on "Sub-Oceanic Changes," printed in the *Journal* for August and September, 1897, Prof. Milne gave particulars of such changes, with a map (p. 264) showing the remarkable submarine gully which there exists, in the neighbourhood of which changes from 13 or 20 to upwards of 200 fathoms have taken place within a twelvemonth. In connection with the recent earthquake, it is of interest to note that the instruments at Shide recorded, on December 21, 1905, a striking series of disturbances by which the whole eastern side of Japan was shaken from north to south. The origin was beneath the Pacific ocean, and the first tremor reached Tokyo at $10^h\ 50^m\ 40^s$, or $1^h\ 50^m\ 40^s$ G.M.T. Quite recently the island of Formosa has also been shaken by a violent earthquake.

POLAR REGIONS.

Mr. Mikkelsen's Arctic Expedition.—Writing from New York on February 21, Mr. Mikkelsen announced that satisfactory progress had been made with the preparations for his expedition to the Beaufort sea (February number, p. 201). He had been fortunate in obtaining a generous grant of $3000 from the American Geographical Society, this being by far the largest grant ever made to an explorer by that body. The doubts as to the obtaining of a special ship for the purposes of the expedition are thus set at rest, and Mr. Mikkelsen had already had three or four offers of vessels, the most suitable being quite a new schooner, with auxiliary steam-power, which had been confiscated by the U.S. Government for unlawful fishing.

Danish Scientific Station in Greenland.—Early last year (*Journal*, vol. 25, p. 98) we alluded to the project set on foot by Mr. Morten P. Porsild for the establishment of a permanent scientific station in West Greenland. We are pleased to be able to state that the execution of this scheme is now secured, the cost of the foundation of such a station having been defrayed by a gift from Mr. A. Holck, a member of the Copenhagen bar, while the Danish Government has promised an annual grant of 10,000 kroner (£600) towards its maintenance. The place chosen is the south coast of Disco island, whither Mr. Porsild will proceed during the summer of the present year. A well-equipped laboratory, with a special view to biological work, will be attached to the station, and facilities will be given to visiting naturalists, foreign as well as Danish, who may wish to carry on research thereat, a small fee being charged for board only. It is hoped to establish a library of Arctic literature, which it is desired to make as complete as possible, and as the funds will not admit of large expenditure on purchases, the station must largely depend on the generosity of those interested in the matter to further the end in view by the presentation of suitable works, especially those dealing with Arctic biology.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Bottom Temperatures of Lakes.—The limnological work of recent years has frequently brought out the supposed fact that the bottom temperature is appreciably higher than that of intermediate layers. That this may—in some cases, at least—be only an apparent character is shown by Baron von Aufsess in a note in *Petermanns Mitteilungen* (1905, No. 11). Having found that the apparent rise in temperature may sometimes be explained as due to the increased pressure on the thermometer at greater depths, that observer lately carried out experiments with a specially constructed instrument, in which an ordinary minimum thermometer was enclosed in a stout glass tube, partially but not wholly filled with water before being sealed up. The water has the effect of accelerating the adjustment of the internal temperature to that of the water outside, while the air-space is necessary as a further safeguard against the influence of pressure at great depths. By taking a series of temperatures with this instrument and with an ordinary thermometer simultaneously, Baron von Aufsess found that at depths between 100 and 200 metres the difference might amount to as much as half a degree Centigrade (0·9° Fahr.), and that when allowance had been made for this, no general excess of temperature was observable in the bottom layer. Where such does exist (after the necessary correction), he is inclined to attribute it to local causes, such as springs, or to suppose that the position of the upper and lower observations may not exactly correspond, owing to the drifting of the boat. It does not seem possible to apply any constant correction on the score of the influence of pressure, and the use of some such appliance as has been described seems

necessary to avoid error, though care is needed to allow sufficient time for the equalization of the internal with the external temperature, which probably involves from twenty minutes to half an hour.

Early Knowledge of the Compass.—We have received from the author, Herr Heinrich Wehner, an interesting paper on the knowledge of the polarity of the magnetic needle in the early middle ages, forming Heft 11 of the *Vorträge und Abhandlungen* issued by the magazine *Das Weltall*. Herr Wehner bases his study on the orientation of sacred edifices in Europe during the period in question, a subject to which he has devoted his attention for some time, and on which he has now collected a large body of data, either by personal observation or by correspondence. The first part of the paper is taken up with a refutation of the idea, held by many, that in early days churches were laid down with their axes pointing to the quarter of the horizon in which the sun rose on the day of the saint to whom they were dedicated; and his case in regard to this point certainly seems a strong one. The supporters of the view alluded to have in many cases been forced to take the sun's azimuth at *setting* as determining the orientation, while the number of separate days in the calendar with which a given church might possibly be associated gives so much latitude that the value of the conclusions are considerably weakened. The author's own view is that the orientation was fixed by the use of the magnetic needle, not only from about 1500 onwards, for which period direct historical evidence is available, but during many centuries previously, the freemasonry of the building trade having prevented the properties of the needle from becoming generally known. The importance of this claim is evident from the fact that, were it substantiated, not only would our ideas as to the early knowledge of the compass be radically altered, but in the churches which have come down to us we should possess a hitherto hidden key to the magnetic variation in past centuries (in the case of churches the date of whose foundation is known), while at the same time a guide to the date of foundation of others would be forthcoming. Herr Wehner allows that further data must be collected before the question can be definitely settled, but he gives a large number of instances which certainly tell in favour of his view. He supplies for a number of German churches the observed azimuth of the axis side by side with the date of foundation, though he unfortunately does not make it quite clear to what extent the latter is vouched for by historical evidence, the exact date given being apparently deduced from the orientation in accordance with the general laws of the change of magnetic declination. But in any case it may be presumed that such dates agree, in a general way at least, with the historical data. The results of further research will be awaited with much interest.

The Third International Conference on Glaciers met last summer at Maloja in the upper Engadine, with a special view to discussing the relation between *névé*-stratification and the "banding" (*Bänderung*) observable in the glacier-snout, a subject which had been left open at the previous conferences of 1899 and 1901 (cf. *Journal*, vol. 16, p. 233). It was summoned by Prof. H. F. Reid, of Baltimore (who had made a special study of the question at the Forno glacier), and was attended by sixteen scientists, including Prof. E. J. Garwood, as representative of Great Britain. A short account of the proceedings was given by Professors Finsterwalder and Brückner in *Petermanns Mitteilungen* for November last (vol. 51, p. 256). In his opening addresses Prof. Reid expressed the belief that the view put forward sixty years before by Agassiz, that the banding is the direct outcome of the stratification of the *névé*, had been substantiated by his observations, and would, he hoped, be accepted by the conference. Two days (September 7 and 8) were devoted to an examination of the Forno glacier under

his guidance, and at the concluding meeting on the 9th, the members unanimously accepted Prof. Reid's views as embodied in a memorandum drawn up by Professors Brückner and Finsterwalder. In this the processes which seem to bring about the conversion of the *névé* stratification into the banding of the lower part of the glacier were fully set forth, and the conclusions with regard to certain other phenomena duly recorded. One of these was the behaviour of parasitic glaciers, of which a good example had been examined by the conference. In this case a small side glacier to the Forno glacier carried a parasitic glacier, while a third rested partly on each of the two first. It was found that, although the dividing surfaces were clearly evidenced by dirt-bands, there was no trace of sliding movement between the component glaciers, all three being evenly traversed by crevasses.

GENERAL.

Colonial Congress and Oceanographical Exhibition at Marseilles.—For some time past preparations have been in full swing for a French Colonial Congress, to be held at Marseilles in September next, under the presidency of M. J. Charles Roux, the well-known writer on colonial subjects. From the intimate connection which exists between marine and colonial affairs, it has been decided to extend the scope of the Congress by the addition of an exhibition, intended to illustrate all matters connected with the scientific study of the sea and its fisheries. Its organization was entrusted to M. Charles Bénard, president of the Oceanographical Society of the Golfe de Gascogne, who has done more than any one else to further the study of oceanography in France within recent years. In recognition of the fact that the sea knows no political boundaries, it was wisely decided to give the exhibition an international character, and the co-operation of the leading oceanographers of all nations was invited. A British committee was formed under the presidency of Sir John Murray, including representatives of the principal organizations connected with the study of oceanography and marine biology in this country, and under its auspices a representative British exhibit has been got together. The Society will be represented at Marseilles by Captain Wilson Barker, and, among other exhibits, has sent the model of the Antarctic exploring ship *Discovery*, a special feature of the exhibition being the illustration of the great scientific exploring expeditions. It will include—besides examples of the best scientific instruments and appliances, charts, photographs, etc.—a number of sections devoted to the industrial side of the subject: the equipment of fishing-vessels, appliances for the capture and preservation of fish, life-saving apparatus, and many other classes of objects. A congress of geographical societies and of the "Alliance française" (an association for the extension of the French language in the colonies and abroad) will also be arranged, the geographical section being under the presidency of M. le Myre de Vilers, president of the Paris Geographical Society. Its proceedings will be devoted towards furthering the spread and advancement of geographical science.

Honours for Captain Scott and Major Ryder.—The American Geographical Society has awarded its gold medal to Captain R. F. Scott, Commander of the National Antarctic Expedition; it will be presented by the American Ambassador at the meeting of the Society on April 9. The Paris Geographical Society has awarded a gold medal to Major C. H. D. Ryder, for his geographical work in connection with the Tibet Mission.

OBITUARY.

The Right Hon. Sir Hugh Muir Nelson, P.C., K.C.M.G.

The Queensland branch of the Royal Geographical Society of Australasia has suffered a severe loss by the death of its president, Sir Hugh Nelson, Lieut.-Governor and President of the Legislative Council of Queensland, which occurred at Toowoomba on New Year's Day. Our own Society also loses a distinguished member, Sir Hugh having been elected a Fellow in 1903. A son of the Rev. Dr. Nelson, who for many years played an honourable part in the life of the colony, Hugh Muir Nelson was born at Kilmarnock on December 31, 1835, and after being educated at the Edinburgh High School and Edinburgh University, emigrated with the rest of the family to Ipswich, near Brisbane, in 1853. As Queensland was not separated from New South Wales till 1859, his connection with the State in which he attained to such high office thus dated back to its earliest days as a distinctive colony. After a brief experience of business life at Ipswich, young Nelson turned his attention to farming, and for many years took an active part in the pastoral development of the Darling Downs region. It was not until he was nearly fifty years of age, in 1883, that he entered political life as a member of the Legislative Assembly, but from that time he rapidly rose from one position of public prominence to another. From 1858 to 1890 he acted as Secretary for Railways and Public Works, and in 1893 became Premier, Chief Secretary, and Treasurer of the Colony, a position he held with distinction during a period when the finances of Queensland needed particularly careful handling. Having been created a K.C.M.G. in 1896, and a member of the Privy Council in 1897, in which year he represented the colony in London at the Diamond Jubilee celebrations and received the honorary degree of D.C.L. from the University of Oxford, Sir Hugh Nelson resigned office in 1898 to become President of the Legislative Council. Five years later he was appointed Lieut-Governor of the State. His interest in geography is sufficiently indicated by his position at the head of the Queensland Society; in particular, he did a useful work in extending the activity of the Society in parts of the State outside of Brisbane.

CORRESPONDENCE.

Tanganyika or Tanganika.

Will you permit me, through the medium of your columns, to bring before the Fellows of the Royal Geographical Society the question of the orthography of the word "Tanganyika"? During my recent expedition to the lake, I am only conscious of having heard the name pronounced as is phonetically written Tanganika—that is to say, the *y* sound was conspicuously absent. I should like to urge, therefore, that in future the spelling Tanganika should be adopted.

Although the spelling most usual in this country is Tanganyika, the word is not infrequently written Tanganika in German and French publications, and the latter appears to be the spelling adopted by the government of Zanzibar. Stanley also, whose opinion is worthy of consideration, invariably wrote Tanganika, and considered the *y* to be superfluous. I might point out, too, that the spelling Tanganyika is the cause of not infrequent mispronunciation in this country, the name being pronounced as if it consisted of five syllables, instead of four.

If it be urged that it is undesirable to alter the spelling so widely used in the past, I would remark that the revised spelling differs so little from the old that it could not well cause any confusion. Again, I believe it is a fact that the spelling of other African place-names has been altered in comparatively recent years, in order to bring it into line with modern phonetic practice, such as Mombassa of the older writers, which is now officially spelled Mombasa.

W. A. Cunnington.

Christ's College, Cambridge.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1905–1906.

Eighth Meeting, February 26, 1906.—Colonel Sir Thomas H. Holdich, K.C.M.G., K.C.I.E., C.B., R.E., Vice-President, in the Chair.

Elections:—*Lieut.-Colonel Campbell Anderson, D.S.O.; Emile A. Bruguière; William Leckie-Ewing; Richard Cope Morgan; Captain Alexander Greig Noble; Francis Reclam O'Neill; John Sanderson; Charles G. Seligmann, M.B.*

The paper read was:—

"Travels on the Boundaries of Bolivia and Peru." By Baron Erland Nordenskjöld.

Ninth Meeting, March 12, 1906.—The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., LL.D., F.R.S., President, in the Chair.

Elections:—*Señor D. A. Arauz; Ernest Way Elkington; H. Llewellyn Goodwin; William Kelway; Lieut. Chas. G. A. Lenny, R.N.; Wallace Foster Marsden; J. R. Southworth; Ernest Henry Wands.*

The paper read was:—

"Recent Journeys in the Rhodope Balkans." By Colonel F. R. Maunsell, C.M.G., R.A.

RESEARCH DEPARTMENT.

March 9, 1906.

"Geographical Distribution of the Alpine Race in Europe." By J. L. Myres.

Tenth Meeting, March 19, 1906.—The Right Hon. Sir George T. Goldie, K.C.M.G., D.C.L., F.R.S., President, in the Chair.

Elections:—*H. Peters Bone; Wm. Charles Cooke; Stewart Spencer Davis; Sir Edward L. Durand, Bart.; Cressy Stephen Edmondson; Evan Dalton Griffiths; Joshua M. Hamilton; Colonel Sir Buchanan Scott, K.C.I.E., late R.E.*

The paper read was:—

"The Economic Geography of Australia." By Prof. J. W. Gregory, F.R.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C. R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological, etc.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Austria—Alps. *M.K.K.G. Ges. Wien* **48** (1905): 561–570. **Wissert.**

Das Wangernitzenkar in der Schobergruppe. Von A. Wissert. *With Map and Illustrations.*

Results of the sounding of two tarns at an elevation of some 8000 feet.

Austria—Herzegovina. **Daneš.**

Úvodí dolní Neretvy. Geomorfologická studie. Napsal Dr. J. V. Daneš. v Praze, 1905. Size 10 × 6½, pp. 108. *Diagrams and Illustrations. Presented by the Author.*

On the basin of the lower Narenta.

Austria-Hungary. *Scottish G. Mag.* **22** (1906): 1–9. **Richardson.**

The Ethnology of Austria-Hungary. By R. Richardson. *With Map.*

France. **Dubois and Guy.**

Album Géographique. Par M. Dubois et C. Guy. [Vol. 5.] La France. Paris: A. Colin, 1906. Size 11½ × 9, pp. xvi. and 244. *Illustrations. Price* 20 *fr.*

Completes the series begun some ten years ago. As in the previous parts, the pictures are well chosen, and present a vivid idea of the varied aspects of nature and human activity.

France—Alps. *C. Rd.* **141** (1905): 754–757. **Helbronner.**

Sur les triangulations géodésiques complémentaires des hautes régions des Alpes françaises (troisième campaigne). Note de P. Helbronner.

France—Haute Marne. *Ann. G.* **13** (1904): 223–242, 310–321. **Bulard.**

L'industrie du fer dans la Haute-Marne. Par M. Bulard. *With Maps.*

France—Hérault. **Ferrasse.**

B.S. Languedoc. G. **27** (1904): 218–229; **28** (1905): 15–34, 205–221, 249–264.

Les Cavités naturelles du département de l'Hérault. Par E. Ferrasse. *With Plans.*

France—Historical. *Mém. A. Dijon* **9**, 1903–4 (1905): 67–175. **Oursel.**

Courtépée.—Papillon. Voyages en Bourgogne. Publiés par C. Oursel.

Reprints of narratives of journeys made by Courtépée (the projector of the 'Description du duché de Bourgoyne') in 1757 and 1758, and by Papillon in 1722.

France—Nomenclature. *Ann. G.* **13** (1904): 207–222. **Gallois.**

La Weŏvre et la Haye: Étude de noms de pays. Par L. Gallois.

France—Ports. *Ann. G.* **13** (1904): 243–256, 322–333. **Léon.**

Les grands ports français de l'Atlantique. Par P. Léon.

France—Var. *C. Rd.* **141** (1905): 1053–1055. **Martel and de la Forest.**

Sur Fontaine-l'Évêque et les abîmes du Plan de Canjuers (Var). Note de E. A. Martel et Le Couppey de la Forest.

Germany—Bavaria. *Globus* **88** (1905): 357–362. **Jaeger.**

Der Tegernsee. Von J. Jaeger.

Germany—Oceanography. *Z. Ges. E. Berlin* (1905): 427–432. **Dinse.**

Die Studienfahrt des Instituts für Meereskunde nach Stettin, Swinemünde, Rügen und Bornholm. Von Dr. P. Dinse.

Greece—Athens. **Judeich.**

Topographie von Athen. Von Dr. Walther Judeich. (Handbuch klassischen Altertumswissenschaft herausgegeben von Dr. I. von Müller. 3 Bd., 2 Abt., 2 Teil.) München: C. H. Beck, 1905. Size 10 × 6½, pp. xii. and 416. *Plans. Price* 18*s.*

One of a series of handbooks dealing with classical antiquities. It gives a useful summary of our knowledge of ancient Athens.

Greece—Geology. *C. Rd.* **141** (1905): 918–920. **Négris.**

Émersion crétacée en Grèce. Note de P. Négris.

Holland—Phenology. **Bos.**

Ts. K. Ned. Aard. Genoots. Amsterdam **23** (1906): 135–138.

Phyto-Phaenologiese waarnemingen in Nederland over het jaar 1904. Door Dr. H. Bos.

United Kingdom—England. *P.S. Antiquaries* **20** (1904–5): 247–252. **Martin.**

Report on some antiquities in the neighbourhood of Bath. By A. T. Martin.

Includes the account of an examination of a supposed Roman road.

United Kingdom—Ireland. **Lamplugh and others.**

Memoirs of the Geological Survey, Ireland. The Geology of the country around Cork and Cork Harbour. (Explanation of the Cork Colour-printed Drift Map.) By G. W. Lamplugh, J. R. Kilroe, A. M'Henry, H. J. Seymour, W. B. Wright, and H. B. Muff. Dublin; London: E. Stanford, 1905. Size 9½ × 6, pp. viii. and 136. *Plans and Illustrations. Price* 3*s.*

United Kingdom—Rivers. *Nature* **73** (1905–6): 29–30. **Wheeler.**

The Aeger in the Rivers Trent and Ouse. By W. H. Wheeler. *With Illustration.*

United Kingdom—Scotland. **Hill and others.**

Mem. Geological Survey, Scotland. The Geology of Mid-Argyll (explanation of Sheet 37). By J. B. Hill, with the collaboration of B. N. Peach, LL.D., C. T. Clough, and H. Kynaston; with Petrological Notes by J. J. H. Teall, D.SC., and J. S. Flett, D.SC. Glasgow; London: E. Stanford, 1905. Size 9½ × 6, pp. vi. and 166. *Illustrations. Price* 3*s. Presented by the Geological Survey.*

United Kingdom—Somerset. **Balch.**

B. & Mém. S. de Spéléologie **5**, No. 39 (1904): pp. 39.

Les Cavernes et les Cours d'Eau souterrains des Mendip-Hills (Somerset, Angleterre). (Explorations de 1901–1904.) Par M. Herbert E. Balch. *Plans and Illustrations.*

United Kingdom—Wales. **Ward and Baddeley.**

Thorough Guide Series. South Wales and the Wye District of Monmouthshire. By C. S. Ward and M. J. B. Baddeley. 5th edit. London: Dulau & Co., 1906. Size 6½ × 4¼, pp. xvi. and 192. *Maps and Plans. Price* 3*s.* 6*d. net. Presented by the Publishers.*

ASIA.

Asia—Historical. **Foster.**

The Journal of John Jourdain, 1608–1617, describing his experiences in Arabia, India, and the Malay Archipelago. Edited by William Foster, B.A., Cambridge. Printed for the Hakluyt Society, 1905. Size 9 × 6, pp. lxxxii. and 394. *Maps. Presented by the Hakluyt Society.* [To be reviewed.]

Central Asia. **Roborovsky.**

Works of the Expedition of the Imp. Russ. Geogr. Soc. in Central Asia in 1893–95, under the command of V. T. Roborovsky. Part i. Report of the leader of the Expedition. [In Russian.] St. Petersburg, 1900. Size 12 × 8½, pp. xvi. and 610. *Maps (as appendix, separate) and Illustrations. Presented by the Society.*

China. **Clennell.**

China. No. 2 (1905). Report by Mr. W. J. Clennell, His Majesty's Consul at Kiukiang, on a Journey in the Interior of Kiangsi. London: Wyman & Sons, 1905. Size 13½ × 8½, pp. 20. *Map. Price* 8½*d.*

China. *B. Comité Asie Française* **5** (1905): 425–427. ——

La politique française à Kouang-tchéou-ouan. Par R. C. *With Map.*

Chinese Empire—Tibet. **Filchner.**

Das Kloster Kumbum in Tibet. Ein Beitrag zu seiner Geschichte. Von Wilhelm Filchner. Berlin: E. S. Mittler und Sohn, 1906. Size 10½ × 7½, pp. xiv. and 164. *Maps and Illustrations. Presented by the Author.* [To be reviewed.]

A first instalment of matter descriptive of the author's expedition in Tibet and China.

Eastern Asia. *B.S.G. Italiana* **6** (1905): 1056–1074. **Giannitrapani.**

Note sulla Corografia del Teatro della Guerra Russo-Giapponese. Pel cap. L. Giannitrapani. *With Maps.*

Eastern Asia. **Weale.**

The Re-shaping of the Far East. By B. L. Putnam Weale. 2 vols. London: Macmillan & Co., 1905. Size 9 × 6, pp. (vol. 1) xvi. and 548; (vol. 2) x. and 536. *Map and Illustrations. Price* 25*s. net. Presented by the Publishers.*

French Indo-China—Laos. *B.S.R.G. d'Anvers* **29** (1905): 174–185. **Fournier.**

Mission Etienne Richet. Notes sur les Khas du Laos méridional. Par A. Fournier.

India—Cartography. **Pullé.**

La Cartografia antica dell' India. Per F. L. Pullé. Pte. II. Il Medio-evo europeo e il primo Rinascimento. (Studi Italiani di Filologia Indo-Iranica. Anno V—vol. 5.) Firenze: Tip. G. Carnesecchi e Figli, 1905. Size 9½ × 6½, pp. xviii. 140, 22, 24, 56, and 48. *With Facsimiles.*

The first part was noticed in the *Journal* in 1903 (vol. **32**, p. 451).

India—North-West Frontier. *J.R. United Service I.* **49** (1905): 1349–1358. **Roberts.**

The North-West Frontier of India. By Field-Marshal the Right Hon. the Earl Roberts. *With Map.*

India—Survey. ——

Report of the Indian Survey Committee, 1904–05. 2 parts. Simla and Calcutta, 1905. Size 13½ × 8½, pp. (part i.) vi. and 152; (part ii.) vi. and 224. *Maps. Presented by the Government of India.*

The committee was appointed in 1904 to examine the methods and working of the Survey of India Department, with special reference to the topographical maps.

Japan. *M. Deutsch. Ges. Natur- u. Völkerk. Ostasiens* **10** (1905): 243–250. **Doflein.**

Die Tiefseefauna der Sagamibucht. Von Dr. F. Doflein.

Malay Archipelago—Amboina. **Verbeek.**

Description géologique de l'Île d'Ambon. Par R. D. M. Verbeek. With Atlas. (Édition française du Jaarboek van het Mijnwezen in Nederlandsch Oost-Indië, Tome **34**, 1905, partie scientifique.) Batavia: Imp. de l'État, 1905. Size 10 × 7, atlas 20 × 14. *Illustrations. Presented by the Author.*

Malay Archipelago—Morotai. **Schut.**

Ts. K. Ned. Aard. Genoots. Amsterdam **23** (1906): 44–118.

Tweemaal naar Moro (Morotai). Door J. A. F. Schut. *Map and Illustrations.*

Pamirs. *G. Ts.* **13** (1905–6): 112–129, 166–183. **Olufsen.**

Pamir. Rejse igennem Roshan, Darvas og Karategin. Af Premierløjtnant O. Olufsen. *Map and Illustrations. Also separate copy, presented by the Author.*

Philippine Islands. **Kenny.**

Trade of the Philippine Islands, 1904. Foreign Office, Annual No. 3512, 1905. Size 10 × 6½, pp. 56. *Sketch-map and Plan. Price* 7*d.*

Philippine Islands. **Reed.**

Negrito's of Zimbales. By W. A. Reed. (Dept. of the Interior, Ethnological Survey Publs., vol. 2, pt. 1.) Manila, 1904. Size 10¼ × 7¼, pp. 90. *Maps and Illustrations. Presented by the Ethnological Survey for the Philippine Islands.*

Russia—Caucasus. *Alpine J.* **22** (1905): 578–591. **Fischer.**

Climbs in the Caucasus. By Dr. A. Fischer. Part ii.

Russia—Caucasus. *Alpine J.* **22** (1905): 507–511. **Meck.**

In the Western Caucasus. By Alexander von Meck. *Map and Illustrations.*

Russia—Siberia. **Jochelson**

The Jesup North Pacific Expedition. Memoir of the American Museum of Natural History, New York. Vol. 6, pt. 1. The Koryak, Religion and Myths. By W. Jockelson. Leiden: E. J. Brill, 1905. Size 14½ × 11¼, pp. 382. *Map and Illustrations. Price* 42*s.*

Russia—Siberia. *B.A. Imp. Sc. St. Petersbourg* **20** (1904): 49–54. **Rosenthal.**

Densité de la neige à Irkoutsk. Par R. Rosenthal. [In Russian.]

Russia—Siberia. *Deutsch. G. Blätter* **28** (1905): 249–255. **Sibiriakoff.**

Zur Frage von den äusseren Verbindungen Sibiriens mit Europa. Von A. Sibiriakoff.

Russia—Siberia. *Petermanns M.* **51** (1905): 213–214. **Sibiriakoff.**

Ueber eine Eisenbahnverbindung zwischen Kamtschatka und Europa. Von A. Sibiriakoff.

Russia—Siberia. *B.A. Imp. Sc. St.-Petersbourg* **17** (1902): 213–221. **Shostakovich.**

L'épaisseur de la glace sur les bassins de la Sibérie Orientale. Par V. Schostakovitch. [In Russian.] *With Map.*

Turkey—Arabia. *Contemporary Rev.* **88** (1905): 678–682. **Vambéry.**

The Revolt in Arabia. By A. Vambéry.

Turkey—Asia Minor. *R. Engineers J.* **2** (1905): 299–311. **James.**

The Russo-Turkish Frontier Commission in Asia-Minor in 1857–58. By Major-General E. R. James. *With Map.*

Turkey—Asia Minor. **Vannutelli.**

Lamberto Vannutelli. In Anatolia. Rendiconto di una Missione di Geografia Commerciale inviata dalla Società Geografica Italiana. Aprile-Agosto 1904. I. Vilajet Settentrionali. Roma: Società Geografica Italiana, 1905. Size 10 × 7, pp. vi. and 374. *Map and Illustrations. Presented by the Società Geografica Italiana.*

Turkey—Syria. **Dussaud.**

Notes de Mythologie Syrienne. Par R. Dussaud. II.–IX. et Index. Paris: E. Leroux, 1905. Size 10 × 5½, pp. 67–188. *Illustrations. Presented.*

Part I. appeared in 1903.

AFRICA.

Abyssinia. **Collat.**

Renseignements Col., Comité Afrique Française (1905): 421–433, 491–502.

L'Abyssinie actuelle. Par Lieut. Collat.

Algeria. *C. Rd.* **141** (1905): 784–786. **Savornin.**

Sur la tectonique au sud-ouest du Chott el Hodna. Note de J. Savornin.

Algeria and Tunis. *B.S.G. Lille* **44** (1905): 354–365. **Gallois.**

Les Oasis d'Algérie et de Tunisie. Par E. Gallois. *With Illustrations.*

British East Africa. **Jackson.**

British East Africa Protectorate. Report for 1904–5. Colonial Reports, Annual No. 475, 1905. Size 10 × 6, pp. 36. *Price* 2½*d.*

British East Africa. *J. African S.* **5** (1905): 28–37. **Johnston.**

The Colonization of British East Africa. By A. Johnston.

Cape Colony—Meteorology. *T. South African Philosoph. S.* **16** (1905): 97–105. **Marloth.**

Results of Further Experiments on Table Mountain for ascertaining the amount of moisture deposited from the South-East Clouds. By R. Marloth, PH.D. *With Illustration.*

Cape Colony. *T. South African Philosoph. S.* **16** (1905): 189–199. **Rogers.**
The Volcanic Fissure under Zuurberg. By A. W. Rogers. *With Sketch-map.*

Central Africa—Tanganyika. **Cunnington.**
Report of the Third Tanganyika Expedition, 1904–5. By W. A. Cunnington. Cambridge, 1905. Size 9 × 5½, pp. 4.

Rhodesia. *G.Z.* **11** (1905): 564–583. **Philippi.**
Reiseskizzen aus Südafrika. Von Dr. E. Philippi. II. Rhodesia. *With Plates.*

Rhodesia. *J. Anthrop. I.* **35** (1905): 39–47. **White.**
Notes on the Great Zimbabwe Elliptical Ruin. By F. White. *With Plan and Illustrations.*

Sahara. *C.R.* **141** (1905): 566–567. **Chudeau.**
Sur la géologie du Sahara. Note de R. Chudeau.

Sahara. *La G., B.S.G. Paris* **12** (1905): 297–304. **Haug.**
La structure géologique du Sahara central d'après les documents géologiques et paléontologiques de M. F. Foureau. Par E. Haug. *With Illustrations.*

South Africa. *Nature* **73** (1905): 77–78. **Feilden.**
The Stone Age of the Zambesi Valley, and its Relation in Time. By Colonel H. W. Feilden, C.B.

South Africa. *T.S. African Philosoph. S.* **15** (1905): 283–467. **Wilman.**
Catalogue of Printed Books, Papers, and Maps, relating to the Geology and Mineralogy of South Africa. By Miss M. Wilman.

South Africa. **Colquhoun.**
The Africander Land. By Archibald R. Colquhoun. London: John Murray, 1906. Size 9½ × 6½. *Maps. Price* 16*s. net. Presented by the Publisher.*

South Africa—Zambesi. *Nature* **73** (1905): 111–114. **Lamplugh.**
The Batoka Gorge of the Zambesi. By G. W. Lamplugh, F.R.S. *With Illustrations.*

South-West Africa. **Gibson.**
Between Capetown and Loanda. A Record of Two Journeys in South-West Africa. By Alan G. S. Gibson, D.D. London: Wells, Gardner & Co., [1905]. Size 7½ × 5½, pp. xvi. and 204. *Map and Illustrations. Price* 3*s.* 6*d. net. Presented by the Publishers.*

The journeys, which were undertaken with a view to examine the country from a missionary point of view, led overland from Cape Colony to Walfish bay, and from Mossamedes to the same point, the remainder being done in each case by sea. There are few recent books in English on the region traversed, so that in spite of its modest size, this little book supplies some useful information, especially on the southern part of Angola.

Transvaal. ——
Transvaal Mines Department. Report of the Geological Survey for the year 1904. Pretoria, 1905. Size 13½ × 8½, pp. 80. *Maps and Illustrations. Presented by the Geological Survey, Transvaal.*

Tripoli. *B.S.G. Italiana* **6** (1905): 762–773, 930–949. **Regny.**
Nella Tripolitania settentrionale. Note del Prof. P. Vinassa de Regny. *With Map and Illustrations.*

Tunis. *A travers le Monde* **11** (1905): 305–308. **Myrica.**
Sidi-Abdallah, notre Base navale en Afrique. Par P. de Myrica. *With Map and Illustrations.*

Uganda. *B. Imp. I.* **3** (1905): 236–247. ——
Economic Resources of Uganda, with an Account of the Buddu Forest.

West Africa. ——
The West African Pocket Book. A Guide for Newly-appointed Government Officers. Provisional Edition. London: Waterlow & Sons, 1905. Size 7 × 5, pp. 60. *Illustrations. Presented by the Publishers.*

Contains many useful hints on hygiene and other matters.

NORTH AMERICA.

Canada—Climate. *Symons's Met. Mag.* **38** (1903): 1–4, 31–33, 66–70. **Stupart.**
The Canadian Climate. By R. F. Stupart. *With Maps.*

United States—Colorado. *J. Geology* **13** (1905): 556. **Henderson.**
Arapahoe Glacier in 1905. By J. Henderson.

United States—Irrigation. **Vollmer.**
Minutes of P.I. Civil Engineers **162** (1905): 363–369.
An Example of Irrigation in the Arid Regions of the United States. By G. F. Vollmer. *With Map and Plans.*

United States—Louisiana. *U.S. Monthly Weather Rev.* **33** (1905): 204–207. **Shields.**
The Rainfall of the Drainage Area of New Orleans. By F. S. Shields. *Map.*

United States—New York. *U.S. Monthly Weather Rev.* **33** (1905): 196–202. **Horton.**
Snowfalls, Freshets, and the Winter Flow of Streams in the State of New York. By R. E. Horton. *Map and Diagrams.*

United States—Ports. *J.G.* **4** (1905): 337–347. **Brown.**
Geographic Development of Seaports in the United States. By Bessie A. Brown.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. *B.A. Nac. Ci. Cordoba* **18** (1905): 5–152. **Doering.**
Observaciones magnéticas efectuadas en 1895, 1896, 1897, fuera de Córdoba. Por O. Doering.

Central America and West Indies. **Sapper.**
In den Vulcangebieten Mittelamerikas und Westindiens. Reiseschilderungen und Studien über die Vulcanausbrüche der Jahre 1902 bis 1903, ihre geologischen wirthschaftlichen und socialen Folgen. Von Dr. Karl Sapper. Stuttgart: E. Schweizerbartsche Verlagshandlung (E. Nägele), 1905. Size 9½ × 6½, pp. vi. and 334. *Maps and Illustrations. Price* 6*m.* 50. *Presented by the Publisher.* [To be reviewed.]

Chile—Patagonia. **Steffen.**
Reisebilder aus dem Gebiete des Rio Baker und Lago Cochrane (West-Patagonien). Von Dr. H. Steffen. (Sonderabdruck aus den Verh. Deutsch. W. V. Santiago, Band V.) Santiago de Chile, 1905. Size 9½ × 6½, pp. 74. *Map. Presented by the Author.*

Dutch Guiana. *Ts. K. Ned. Aard. Genoots. Amsterdam* **22** (1905): 1085–1091. **Goeje.**
De stand van het wetenschappelijk onderzoek in Suriname. Door C. H. de Goeje. *With Map.*

Dutch Guiana. **Herderschee and others.**
Ts. K. Ned. Aard. Genoots. Amsterdam **22** (1905): 847–1032.
Verslag van de Tapanahoni-expeditie. Door A. F. Herderschee. *With Maps and Illustrations.*

South America—Pilot. ———
The South American Pilot. Part ii. Comprising Magellan Strait, Tierra del Fuego, and West Coast of South America—from Cape Virgins (S.E. Coast) to Panama Bay, including the Galápagos Islands. 10th edition. London: J. D. Potter, 1905. Size 9½ × 6, pp. xxii. and 642. *Index-charts. Price* 3*s.* 6*d. Presented by the Hydrographic Office, Admiralty.*

West Indies. **[Fairbairn.]**
In the West Indies. By W. B. F. London: A. Fairbairns, [1905]. Size 6 × 4, pp. 64. *Illustrations. Price* 1*s. net. Presented by the Author.*

AUSTRALASIA.

New Guinea—Dutch. ———
Ts. K. Ned. Aard. Genoots. Amsterdam **23** (1906): 142–145.
Het landschap Amberbaken op de Noordkust van Nieuw-Guinea. *With Sketch-map.*

New Zealand. *J. Polynesian S.* **14** (1905): 159–160. **Graham.**
Ngutu-au. (An Ancient People who visited New Zealand.) By G. Graham.

New Zealand. *J. Polynesian S.* **14** (1905): 131–158. **Smith.**
Some Whanganui Historical Notes. By S. P. Smith.

POLAR REGIONS.

Antarctic—Belgian Expedition. **Various Authors.**

Expédition Antarctique Belge. Résultats du Voyage du S.Y. *Belgica* en 1897-1898-1899 sous le commandement de A. de Gerlache de Gomery. Rapports scientifiques. Travaux hydrographiques et instructions nautiques, par G. Lecointe. 1er fasc., 1905 (pp. 110), maps, separate, 1903. Météorologie.—Rapport sur les observations météorologiques horaires, par H. Arctowski, 1904 (pp. 52 and 150); Observations des Nuages, par A. Dobrowolski, 1903 (pp. 158); Le neige et le givre, by the same, 1903 (pp. 80). Botanique.—Champignons, par Mmes E. Bommer et M. Rousseau, 1905 (pp. 16); Lichens, par Ed. A. Wainio, 1903 (pp. 46); Les phanérogames des terres magellaniques, par E. de Wildeman, 1905 (pp. 222). Zoologie.—Hydroiden, von Prof. Dr. C. Hartlaub, 1904 (pp. 20); Madreporaria und Hydrocorallia, von Emil von Marenzeller; Actinarien, von Oskar Carlgren, 1903 (pp. 8 and 8); Seesterne, von Dr. Hubert Ludwig, 1903 (pp. 72); Nemertinen, von Dr. Otto Bürger, 1904 (pp. 10); Nématodes libres, par le Dr. J. G. De Man, 1904 (pp. 52); Bryozoa, by Arthur Wm. Waters, 1904 (pp. 114); Copepoden, von Dr. W. Giesbrecht, 1902 (pp. 50); Acariens libres, par E. Trouessart et A. D. Michael, Acariens parasites, par L. G. Neumann; Araignées et faucheurs, par E. Simon, 1903 (pp. 10, 6, 6, 8); Myriapodes, par C. Attems, Collemboles, par V. Willems, 1902 (pp. 6, 20); Mollusques (Amphineures, Gastropodes et Lamellibranches), par Paul Pelseneer; Céphalopodes, par L. Joubin, 1903 (pp. 86); Poissons, par Louis Dollo, 1904 (pp. 240); Cétacés, par Émile G. Racovitza, 1903 (pp. 142); Organogénie des Pinnipèdes: I. Les extrémités, par H. Leboucq, 1904 (pp. 18). Anvers: Imp. J. E. Buschmann. Size 13¼ × 11. *Maps and Plates. Presented.*

Antarctic—Geology. *C. Rd.* **141** (1905): 1036-1038. **Gourdon.**

Les roches éruptives grenues de la Terre de Graham recueillies par l'expédition antarctique du Dr. Charcot. Note de E. Gourdon.

Arctic. *G. Ts.* **18** (1905-6): 145-149. **Mikkelsen.**

Om Land norden for Beringstrædet og en Ekspedition dertil. Af E. Mikkelsen.

Arctic—Oceanography. **Åkerblom.**

Expédition de M. A. G. Nathorst en 1899. Recherches océanographiques. Par F. Åkerblom. Upsala: Imp. E. Berling, 1904. Size 10 × 6¼, pp. 80. *Maps.*

Greenland. *G. Ts.* **18** (1905-6): 164-166. **Engell.**

Om fremtidige Gletsjermaalinger i Grønland. Af M. C. Engell.

A reply to Lieut. Koch (see below).

Greenland. *G. Ts.* **18** (1905-6): 155-164. **Koch.**

Om fremtidige topografiske Arbejder og Gletsjermaalinger i Grønland, belyst ved en Kritik af Dr. M. C. Engell's Ekspedition i 1902. Af Premierløjtnant J. P. Koch.

Polar. ———

Congress of Mons. Project of an International Association for the Study of the Polar Regions. Report. [Mons, 1905.] Size 11 × 9, pp. 2. *Presented by the Association.*

Spitsbergen. *J. Geology* **13** (1905): 611-616. **Stevenson.**

Recent Geology of Spitzbergen. By J. J. Stevenson.

MATHEMATICAL GEOGRAPHY.

Astronomy. *Nature* **73** (1906): 258-259. ———

The Great Gnomon of Florence Cathedral. By W. E. R. *Illustration.*

Based on an article by Mr. W. A. Parr on the contrivance for determining the advent of the summer solstice designed by Toscanelli.

Compass. *Ann. Hydrographie* **34** (1906): 27-34. **Meldau.**

Ueber das neue Modell des Fluidkompasses von Magnaghi. Nebst Bemerkungen zur Theorie der teilweise auf Nadelinduktion beruhenden Quadrantalkorrektoren. Von Dr. H. Meldau. *With Illustrations.*

Geodesy. *G. Ts.* **18** (1905-6): 152-154. **Engell.**

Om det geografiske Koordinatsystem paa Geoiden og dets Definition. Af Dr. M. C. Engell.

Surveys. *Scottish G. Mag.* **22** (1906): 18–29. **Johnston.**

A brief description of the Ordnance Survey, and some notes on the Advantages of a Topographical Survey of South Africa. By Colonel D. Johnston, C.B. *With Illustrations.*

A paper read before the British Association.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Climatology. *Naturw. Wochenschrift* **20** (1905): 712–716. **Stentzel.**

Die Austrocknung der Kontinente. Von A. Stentzel. *With Sketch-maps.*

The writer discusses the evidences of recent desiccation, and concludes that they point to a secular process, due to an increase in the heat derived from the sun.

Geomorphology. *C. Rd.* **141** (1905): 808–811. **Lapparent.**

L'évolution du relief terrestre. Note de A. de Lapparent.

Geomorphology—Moors. *Z. Ges. E. Berlin* (1905): 702–717. **Solger.**

Die Moore in ihren geographischen Zusammenhange. Von Dr. F. Solger.

Oceanography. *Ann. Hydrographie* **33** (1905): 457–469. **Knudsen and Reinicke.**

Meereskunde mit besonderer Berücksichtigung der dänischen Gewässer. Von M. Knudsen. Im Auszuge mitgeteilt von Kapt. Reinicke.

Oceanography. **Murray.**

Logs of the *Oceana* (November, 1898) and *Discovery* (August to October, 1901), kept by Mr. George Murray, F.R.S. [MS.] Sizes 8½ × 7 and 10½ × 8½. *Presented by G. Murray, Esq., F.R.S.*

Oceanography. *B. Musée Océanograph. Monaco*, No. **46** (1905): pp. 32. ——

Campagne Scientifique de la *Princesse-Alice* en 1905, liste des Stations. *With Map.*

Oceanography—Arctic Seas. **Knipovich.**

Ann. Hydrographie **33** (1905): 193–205, 241–260, 289–308, 337–346.

Hydrologische Untersuchungen im Europäischen Eismeer. Von N. Knipowitsch. *Diagrams.*

Oceanography—Deposits. *C.R.* **141** (1905): 669–671. **Thoulet.**

Distribution des sédiments fins sur le lit océanique. Note de J. Thoulet.

Oceanography—Indian Ocean. *Ann. Hydrographie* **33** (1905): 498–513. **Lütgens.**

Oberflächentemperaturen im südlichen Indischen Ozean 1901 bis 1903. Von Dr. R. Lütgens. *With Diagrams.*

Oceanography—Indian Ocean. *Ann. Hydrographie* **33** (1905): 379–380. ——

Ueber ein vermutetes unterseeisches Korallenriff im zentralen Indischen Ozean.

Phytogeography. *K. Svensk. vet.-A. Handl.* **39**, No. 2 (1905): pp. 208. **Areschoug.**

Undersökningar öfver de tropiska växternas bladbyggnad i jämförelse med de Arktiska och boreala växterna. Af F. W. C. Areschoug. *With Plates.*

On the forms of leaves in the tropics as compared with those of northern regions.

Rivers—Fords. *Petermanns M.* **51** (1905): 207–212. **Tronnier.**

Ueber Furten. Eine Skizze von R. Tronnier.

Discusses in outline the physical characters and causes of fords, with a few words on their importance to human life.

Seismology. *Scottish G. Mag.* **21** (1905): 569–582. **Knott.**

Seismological Studies. By Prof. C. G. Knott, D.Sc. *With Diagram.*

Terrestrial Magnetism. *Terrestrial Magnetism* **10** (1905): 143–144. **Bauer.**

Inauguration of the Magnetic Survey of the North Pacific Ocean. By L. A. Bauer. *With Illustration.*

Terrestrial Magnetism. **Wehner.**

Ueber die Kenntnis der magnetischen Nordweisung im frühen Mittelalter. Von Heinrich Wehner. (Sonderabdruck aus . . . "Das Weltall" 1905, Heft 18–20.) Trepow b. Berlin, 1905. Size 11 × 8, pp. 20. *Diagram. Presented by the Author.*

See note in Monthly Record (*ante*, p. 409).

Tides. *J.G.* **4** (1905): 290–294. **Davis.**

Illustration of Tides by Waves. By W. M. Davis. *With Illustration.*

Volcanoes. *Popular Sc. Monthly* **67** (1905): 555–560. **Eastman.**

Greek Ideas of Vulcanism. By Dr. C. R. Eastman.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical. **Speight and Nance.**

Britain's Sea Story, B.C. 55—A.D. 1805. Being the Story of British Heroism in Voyaging and Sea-Fight from Alfred's Time to the Battle of Trafalgar. With an Introduction tracing the development of the structure of Sailing Ships from the earliest times. Edited by E. E. Speight and R. Morton Nance. London: Hodder & Stoughton, 1906. Size 7½ × 5, pp. xii. and 428. *Illustrations. Price 2s. 6d. net. Presented by the Publishers.*

A valuable addition to school literature, as no reader dealing in precisely the same way with the British maritime history has hitherto been available. The descriptions of famous exploits are mostly in the words of recognized authorities, and the illustrations may be trusted to give an accurate representation (so far as is possible) of the ships of former times, of which subject Mr. Nance has long made a special study.

BIOGRAPHY.

Dombey. **Hamy.**

Joseph Dombey, Médicin, Naturaliste, Archéologue. Explorateur du Pérou, du Chili et du Brésil (1778–1785). Sa vie, son œuvre, sa correspondance. Par le Dr. E. T. Hamy. Paris: E. Guilmoto, 1905. Size 9 × 5½, pp. cviii. and 434. *Map and Illustrations. Price 5s. 8d.*

This traveller, whose special branch of study was botany, received his commission to explore the natural productions of Peru from the French minister, Turgot.

GENERAL.

Sailing-craft. **Smyth.**

Mast and Sail in Europe and Asia. By H. Warington Smyth. London: John Murray, 1906. Size 9½ × 6, pp. xx. and 448. *Illustrations. Price 21s. net. Presented by the Publisher.*

A most interesting account of a great variety of sailing vessels, with most of which the author has gained personal acquaintance during his wide travels, and which are admirably illustrated from his own sketches. The work does not pretend to be an exhaustive treatise on the rig of sailing-craft, but supplies numberless details which could not be included in a more comprehensive work. The arrangement is geographical.

Ski-running. **Somerville, Rickmers, and Richardson.**

Ski-running. By D. M. M. Crichton Somerville, W. R. Rickmers, and E. C. Richardson. Edited by E. C. Richardson. 2nd edit. London: H. Cox, 1905. Size 9 × 6, pp. iv. and 116. *Illustrations. Presented by D. M. M. Crichton Somerville, Esq.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Belgium. **Institut Cartographique Militaire, Brussels.**

Carte Topographique de la Belgique. Scale 1:40,000 or 1·6 inch to a stat. mile. Sheets: 34, Tongres, 1905; 35, Gemmenich, 1904; 40, Wavre, 1904; 43, Limbourg, 1905; 47, Namur, 1905; 59, St. Hubert, 1904; 61, Limerlé, 1904. Brussels: Institut Cartographique Militaire. *Price 3 fr. each sheet.*

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales:—Sheets published by the Director-General of the Ordnance Survey, Southampton, from February 1 to 28, 1906.

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S.E., 79 N.W., N.E., 81 N.E., 82 N.W., N.E. **Lincolnshire**, 105 S.W., 116 N.W., 117 N.W., N.E., 147 N.W. **Norfolk**, 95 N.W., 97 N.W., S.E. **Somerset**, 68 S.E. **Warwickshire**, 41 S.W. **Worcestershire and ditto (Det. No. 7)**, 25 N.E., 46 S.E., 48 S.W., 63 S.W. **Yorkshire** (First Revision of 1891 Survey), 288 S.W. *1s. each.*

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Germany. **K. Preussische Landesaufnahme.**

Karte des Deutschen Reiches. Herausgegeben von der Kartographischen Abteilungen der K. Preussische Landesaufnahme. Scale 1:100,000 or 1 inch to 1·6 stat. mile. Sheets: (plain) 339, Dessau; (brown hills and contours) 334, Höxter. Berlin: K. Preussische Landesaufnahme, 1905. *Price* 1.50 *mark each sheet.*

ASIA.

British North Borneo. **British North Borneo Company.**

A map of British North Borneo. Compiled from the English Admiralty Charts, and from the surveys and explorations of Messrs. F. X. Witti, W. B. Pryer, F. Hatton, Henry Walker, D. D. Daly, and R. D. Beeston, in the service of the British North Borneo Company. Scale 1:633,600 or 1 inch to 10 stat. miles. 2 Sheets. London: Edward Stanford, 1906. *Price 2s. 6d.*

By comparing this map with the edition published in 1903, it will be seen that a considerable amount of new geographical information has been obtained during the interval. This is specially the case with regard to the interior region bordering on the Dutch territory. A great deal of the country still remains unexplored, and much that is shown on the map is of a very approximate and sketchy nature.

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 9 N.E., parts of district Sukkur, and and Khairpur State (Sind, Bombay Presidency), additions to 1901. 21 N.W., parts of district Thar and Parkar, and of States Palanpur and Palanpur Agency (Bombay Presidency), and of Jodhpur (Rajputana), 1905. 25 N.E., Island of Bombay, and parts of districts Kolaba, Poona, and Thana, and Bhor State (Bombay Presidency), 1905. 39 N.E., parts of districts Ahmednagar (Bombay Presidency), Bir and Usmanabad (Nizam's Dominions), additions to 1903. 39 S.E., parts of districts Sholapur, Ahmednagar, Poona, and Phaltan State (Bombay Presidency), and districts Naldurg and Bir (Nizam's Dominions), additions to 1905. 59 S.E., parts of districts Kolar, Tumkur, and Chitaldroog (Mysore), and of Anantapur and Cuddapah (Madras), 1905. 67 S.E., parts of districts Bareilly, Pilibhit, Shahjahanpur, and Kheri (United Provinces), and Nepal (Native State), additions to 1903. 69 S.E., parts of Districts Hanurpur, Fatehpur, and Banda (U.P. of Agra and Oudh), and State of Bundelkhand (C.I. Agency), additions to 1902. 71 N.W., parts of districts Narsinghpur, Saugor, Damoh, Hoshangabad (C.P.), and of Native State Bhopal, Gwalior, Nawab Basoda, and Muhammadgarh (C.I. Agency), additions to 1902. 130 S.E., parts of districts Naga Hills, Manipur State, and of Naga Tribes (Assam), additions to 1904. 109, part of district Vizagapatam (Madras Presidency), with additions to 1904. 112, parts of districts Darbhanga, Muzaffarpur, Patna, Gaya, Hazaribagh, Monghyr, Bhagalpur, Sonthal Parganas, Dinajpur, Malda, Murshidabad, and Purnea (Bengal), additions to 1903.—India and adjacent countries, scale 1:1,000,000. Sheet 86, parts of Burma and the Andaman Islands.—India, 1 inch to 256 miles, additions to 1904.—Punjab, North-Western Frontier, and Kashmir, 1 inch to 16 miles, 4 sheets, 1905.—Bombay, 1 inch to 4 miles; district Ahmedabad (Second Edition), 1905; district Poona, 1905.—

Bengal, 1 inch to 8 miles; district Tippera, 1903.—Lower Provinces, Bengal, 1 inch to 4 miles; district Dacca (Second Edition), 1904.—U.P. of Agra and Oudh, 1 inch to 4 miles; District Sultanpur, additions to 1905.—North-Western Trans-Frontier Survey, 1 inch to 2 miles. Sheet 437 (Second Provisional Edition), parts of Afghanistan and the Kurram Valley (N.W.F. Province), Seasons 1878–80, 1894–95, 1897–98, 1905.—Assam Survey, 1 inch to a mile. Sheet 7, part of District Goalpara, Season 1891–92, 1904.—Bombay Survey, 1 inch to a mile. Sheets: 111 (Second Edition), parts of district Ahmedabad and States of Vala, and Bhavnagar (Kathiawar Agency), and Baroda, Season 1868–69, additions to 1902; 250, parts of States Gwalior, Indore, and Jhabua (C.I. Agency), and of Panch Mahal's District (Bombay), Season 1879–80, additions to 1895.—Burma Survey, 1 inch to a mile. Sheet 115 (N.S.), parts of districts Sandoway, Thayetmyo, and Kyaukpyu, Seasons 1900–1902, 1905.—Central India and Rajputana Survey, 1 inch to a mile. Sheets: 212, parts of States Gwalior, Indore, and Jhabua (C.I. Agency), and of Panch Mahal's District (Bombay), Season 1879–80, additions to 1895; 214, parts of States Gwalior, Indore, Dhar, Rajpur Ali, Jhabua, and Jobat (C.I. Agency), Season 1875–76, additions to 1903; 215, parts of States Gwalior, Indore, Dhar, Rajpur Ali, and Barwani (C.I. Agency), Season 1875–76, additions to 1903; 239, parts of States Gwalior, Jaora, Indore, and Sitaman (C.I. Agency), and Partabgarh (Rajputana Agency), Seasons 1874–75, additions to 1903; 242, parts of States Gwalior, Dhar, Rutlam, and Sailana (C.I. Agency), Seasons 1878–80, additions to 1903; 243, parts of States Gwalior, Indore, Dhar, Rutlam, Sailana, and Jhabua (C.I. Agency), Season 1878–79, additions to 1903; 246, parts of States Gwalior, Indore, and Dhar (C.I. Agency), Season 1873–74, additions to 1903; 247, parts of States Gwalior, Indore, Dhar, and Barwani (C.I. Agency), Seasons 1872–74, additions to 1903; 274, 275, parts of States Gwalior, Indore, and Dewas (C.I. Agency), Season 1877–78, additions to 1903; 301, parts of States Gwalior, Indore, Khilchipur, Narsinghgarh, and Rajgarh (C.I. Agency), and Jhalawar (Rajputana Agency), Season 1875–76, additions to 1905; 302, parts of States Gwalior, Indore, Dewas, Rajgarh, and Narsinhgarh (C.I. Agency), Season 1875–76, additions to 1903; 304, parts of States Gwalior, Indore, Bhopal, Dhar, and Dewas (C.I. Agency), Season 1877–78, additions to 1904; 331, parts of States Gwalior, Indore, Bhopal, Rajgarh, Narsinghgarh, Dewas, and Dhar (C.I. Agency), Season 1877–78, additions to 1904; 375, parts of States Bhopal and Gwalior (C.I. Agency), Season 1872–73, additions to 1904.—Central Provinces Survey, 1 inch to a mile. Sheet 29, parts of Gwalior State (C.I. Agency), Saugor district (C.P.), and Jhansi district (U.P.), Seasons 1856–57, 1864–65, 1870–72, 1895–96, 1905.—Madras Survey, 1 inch to a mile. Sheets: 27, parts of districts Kadur and Shimoga (Mysore), Season 1881–82, additions to 1899; 45, parts of districts Chitaldroog, Kadur, and Shimoga (Mysore), Season 1880–81, additions to 1904.—Punjab Survey, 1 inch to a mile. Sheets 209, part of district Lahore (Rechna and Bari Doab), Season 1902–03, 1905; 212 (Second Edition), parts of districts Montgomery, Lahore, and Ferozepore (Bari Doab), Season 1900–02, 1905.—Sind Survey, 1 inch to 2 miles. Sheets: 79, 80, 97, and 98, parts of districts Sukkur and Upper Sind Frontier, Seasons 1892–93, 1900–03, 1905; 114, Khairpur State, Season 1901–02, 1905.—Sind Survey, 1 inch to a mile. Sheet 39, districts Sukkur, Larkhana, and Upper Sind Frontier, Seasons 1899–1901, 1904.—South-Western Asia, 1 inch to 8 miles. Sheet 72 (Third Edition), parts of Persia and Turkey, 1905.—Index to the Standard Sheets of the Bombay Presidency, additions to 1905.—Index to the Standard Sheets of Sind (Bombay Presidency), additions to 1904. *Presented by H.M. Secretary of State for India, through the India Office.*

Japan. **Landis.**

Mission Map of Japan. Compiled by H. M. Landis. Scale 1:1,250,000 or 1 inch to 19·7 stat. miles. Tokyo: Methodist Publishing House, 1904.

This map gives a great deal of information regarding Christian missions in Japan. It distinguishes towns where churches exist from those without churches; and by the symbol employed to represent the town, its relative size and the number of inhabitants is clearly indicated. Railways are shown in red, and active volcanoes are clearly distinguished from other peaks. In addition to the principal map, there are nine inset maps and plans.

AFRICA.

Africa. **Topographical Section, General Staff.**

Map of Africa. Compiled in the Topographical Section, General Staff. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheets: (Gold Coast) 60-O, 60-P. London: Topographical Section, General Staff, War Office, 1906. *Price* 1*s.* 6*d. each sheet. Presented by the Director of Military Operations.*

Algeria. **Service Géographique de l'Armée, Paris.**

Carte topographique de l'Algérie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet 117, Mezloug. Paris: Service géographique de l'Armée, [1906]. *Price 1.50 fr. each sheet.*

Egypt. **Survey Department, Cairo.**

Topographical Map of Giza Province. Scale 1 : 10,000 or 6·3 inches to a stat. mile. Sheets: S.E., Nos. 2-4, 2-5, 2-6, 3-4, 3-5, 3-6, 4-5, 4-6, 4-7, 5-5, 5-6, 5-7, 6-5, 6-6, 6-7, 7-5, 7-6, 7-7, 8-5, 8-6, 8-7, 9-5, 9-6, 9-7. Cairo: Survey Department, 1905. *Presented by the Director-General, Survey Department, Cairo.*

German East Africa. **Sprigade and Moisel.**

Karte von Deutsch-Ostafrika. Begonnen unter Leitung von Dr. Richard Kiepert, fortgesetzt unter Leitung von Paul Sprigade und Max Moisel. Scale 1 : 300,000 or 1 inch to 4·7 stat. miles. Sheets: D 1, Kunguë-Bucht; D 2, Karema. Berlin: Dietrich Reimer (Ernst Vohsen), 1905. *Presented by Herr Max Moisel.*

With the publication of these two sheets this excellent large-scale map of German East Africa is drawing near completion, only eight more being required to make up the thirty-five of which the map is to consist. Although the material of which it is constructed is often of an approximate nature, yet until a systematic survey is undertaken the map must be considered the chief authority on the geographical features of the region.

Kamerun. **Moisel.**

Der deutsche Lögöne und seine Nachbargebiete. Auf Grundlage der bisher unveröffentlichten Aufnahmen bezw. astronomischen Ortsbestimmungen von Oberlt. v. Bülow (1902–1903), Oberlt. Dominik (1902–1903), Hptm. Glauning (1902–1904), Oberlt. Marquardsen, Lt. Schultze, Lt. v. Stephani, Oberlt. Strumpell und Lt. Schipper (1903–1904) und des gesamten veroffentlichten materials konstruiert u. gezeichnet von M. Moisel. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles. With descriptive text. Sonderabdruck aus den *Mitteilungen aus den deutschen Schutzgebieten*, Band xviii., 1905, Heft. 3. Berlin, 1905. *Presented by Herr M. Moisel.*

This sheet includes the German possessions in West Africa immediately to the south of Lake Chad, and extends from 9° 20′ to 12° 10′ N. lat., and from 13° 30′ to 17° 40′ E. long. The river Shari forms the eastern boundary, and the river Lagone runs through the centre of the sheet. There is an inset plan of Dikoa in the north-east corner, and separate plans showing the Rabbeh palace at Dikoa as it was in May, 1903, and in May, 1904, after the rebuilding of the barracks.

The sheet is accompanied by letterpress by Herr Max Moisel, giving full particulars as to authorities consulted and material utilized in its construction.

Tunis. **Service Géographique de l'Armée, Paris.**

Carte topographique de la Tunisie. Scale 1 : 50,000 or 1·3 inch to a stat. mile. Sheet xvii. Zaouiet Medienn. Paris: Service Géographique de l'Armée, [1905]. *Price 1.50 fr. each sheet.*

AMERICA.

Brazil—S. Paulo. **Commissao Geographica e Geologica de S. Paulo.**

Topographical Map of the State of Sao Paulo. Scale 1 : 100,000 or 1 inch to 1·5 stat. mile. Preliminary edition. Sheets: Atibaia, 1904; Barra de Santos, 1905; Botucatu, 1903; Campinas, 1904; Casa Branca, 1905; Guarehy, 1902; Jacarehy, 1903; Jahu, 1904; Jundiahy, 1905; Mogy-Mirim, 1905; Pindamonhangaba, 1905; Piracicaba, 1905; Pirassununga, 1905; Rio Claro, 1904; S. Carlos do Pinhal, 1903; S. Paulo, 1905; S. Pedro, 1903; Ytu, 1905. Sao Paulo: Commissao Geographica e Geologica. *Presented by the Geographical and Geological Commission of the State of Sao Paulo.*

Although only a preliminary issue, this is a very creditable specimen of a topographical map. The relief is shown by brown contours at intervals of 25 meters, the hundred-metre curves being darker than the others. Rivers are in blue, and roads, railways, and lettering in black. The combined effect is a very clear and useful map, and it is to be hoped that other parts of Brazil may soon be as well surveyed and mapped. The general appearance of the map resembles the U.S. geological and geographical survey.

Canada. **Dept. of the Interior, Ottawa.**

Sectional Map of Canada. Scale 1 : 190,080 or 1 inch to 3 stat. miles. Sheet 116, Rainy Hills, revised to January 11, 1906. Ottawa: Department of the Interior,

Topographical Surveys Branch, 1906. *Presented by the Canadian Department of the Interior.*

Chile—Argentine Boundary. **Oficina de Limites, Santiago.**

Comision Chilena de Limites. Scale 1:250,000 or 1 inch to 3·9 stat. miles. Sheet, Coquimbo. Santiago: Oficina de Limites, [1905]. *Presented by the Oficina de Limites, Santiago.*

The important map of which this sheet forms part was noticed in the *Geographical Journal* for November, 1905. This sheet includes the region extending from 30° to 31° S. lat., and from 60° 40′ to 70° 20′ W. long.

United States. **U.S. Geological Survey.**

Geologic Atlas of the United States. Scale 1:125,000 or 1 inch to 1·9 stat. mile. Folios: 107, Newcastle, Wyoming-South Dakota; 108, Edgemont, South Dakota-Nebraska; 109, Cottonwood Falls, Kansas; 110, Latrobe, Pennsylvania; 111, Globe, Arizona; 112, Bisbee, Arizona; 113, Huron, South Dakota; 114, De Smet, South Dakota; 115, Kittanning, Pennsylvania; 116, Asheville, North Carolina-Tennessee; 117, Casselton-Fargo, North Dakota-Minnesota; 118, Greeneville, Tennessee-North Carolina; 119, Fayetteville, Arkansas-Missouri; 120, Silverton, Colorado; 121, Waynesburg, Pennsylvania; 122, Tahlequah, Indian Territory-Arkansas; 123, Elders Ridge, Pennsylvania; 124, Mount Mitchell, North Carolina-Tennesse; 125, Rural Valley, Pennsylvania; 126, Bradshaw mountains, Arizona; 127, Sundance, Wyoming-South Dakota. Washington: Department of the Interior, U.S. Geological Survey, 1904-5. *Presented by the U.S. Geological Survey.*

GENERAL.

World. **Hopfner.**

Thermische Anomalien. Von Dr. F. Hopfner. *Petermanns Mitteilungen*, Jahrgang 1906, Tafeln 3, 4, und 5. Gotha: Justus Perthes, 1906. *Presented by the Publisher.*

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during November and December, 1905. *Presented by the Hydrographer, Admiralty.*

No.	Inches.	
2598		The World:—Curves of equal magnetic variation, 1907. 4*s.*
3527 m =	6·9	Scotland, west coast:—Rothesay bay and approaches. 3*s.*
3521 m =	6·9	Scotland, west coast:—Ballachulish bay. 2*s.* 6*d.*
2071 m =	6·9	Ireland, south coast:—Youghal harbour. 2*s.* 6*d.*
3557 m =	2·9	Færoe islands. Syderö:—Vaag fiord. 1*s.* 6*d.*
3537 m =	1·45	Norway:—Kongs fiord, Kiberg and approaches, Sylte fiord. 1*s.* 6*d.*
3535 m =	1·4	Norway:—Anchorages on the north coast. 1*s.* 6*d.*
3536 m =	1·4	Norway, north coast. Anchorages on:—Skarsvag and approaches. Lebesby and approaches. Mehavn fiord, Honningsvaag anchorage, Finnkongkieilen Berlevaag anchorage, Vardö, Gamvik and approaches with Koi fiord, Bugö Havn. 2*s.*
2361 m =	0·35	Sweden. Sheet III.:—Öland to Landsort. 2*s.* 6*d.*
2116 m =	0·6	Denmark:—Little Belt. (Plans:—Juelsminde harbour, Svendborg sound.) 4*s.*
3526 m =	6·0	Newfoundland. Bay of Exploits:—Lewisport harbour. 1*s.* 6*d.*
3513 m =	6·0	West Indies. Cuba:—Port Cabañas. 2*s.* 6*d.*
3533 m =	6·0	West Indies. Puerto Rico:—Boqueron bay. 1*s.* 6*d.*
1982*a* m =	0·8	South America, east coast:—River Paraná (from the Paraná Guaru to Ceibal). 2*s.* 6*d.*
1982*b* m =	0·72	South America, east coast:—River Paraná (from Ceibal to Paraná). 2*s.* 6*d.*
3558 m =	0·8	South America, east coast:—River Paraná (from Parana to Caálayti sand). 2*s.*
3523 m =	{6·0 / 4·0 / 8·5}	British Columbia. Plans on the east coast of Vancouver island:—Oyster harbour, Dodd and False narrows, Dodd narrows. 3*s.*
2512 m =	4·0	British Columbia. Vancouver island:—Approaches to Nanaimo harbour. 1*s.* 6*d.*
3517 m =	6·0	British Columbia. Vancouver island:—Nanoose harbour and approach. 3*s.*

No.	Inches.	
3532 m	{2·0 / 7·2}	Africa, west coast. Senegal :—Entrance to the river Kasamanze. Karabane anchorage. 1*s.* 6*d.*
3492 m	9·0	Red sea :—Sheik el Barghût. 2*s.* 6*d.*
3540 m	2·9	Persian gulf, Bahrein island :—Khor Kaliya. 2*s.*
3555 m	4·7	Philippine islands, Negros island :—Danao river and approaches. 2*s.*
3545 m	4·8	Philippine islands :—Approaches to Port Sual and Cabalitian bay, 3*s.*
3542 m	var.	Cochin China. Plans on the coast of Annam :—Kua Viet or Palmo river, Donghoi, Kua Li hoa, Kua Tung, Song hiang. Kua Rone. 1*s.* 6*d.*
3522 m	2·3	China :—Yang tse kiang and its tributaries. 2*s.* 6*d.*
3480 m	4·15	China, east coast :—Shantung promontory to Nagasaki. 2*s.* 6*d.*
3491 m	1·0	China, north-east :—Shitau bay to north-east promontory. 2*s.* 6*d.*
141 m	4·5	Japan. Kiusiu, north coast :—Yobuko ko and approaches. 2*s.*
3511 m	2·0	Japan. Kiusiu, north coast :—Fukuoka wan. 1*s.* 6*d.*
83 m	1·1	Japan, inland sea :—Gogo shima to Miyo shima, including Kurushima Kaikyo. 3*s.*
3546 m	{2·0 / 4·0}	Kuril islands. Plans on the west coast of Yetorofu jima :—Rubetsu wan. Oito wan. Furebetsu anchorage. 2*s.*
3551 m	{5·0 / 1·0}	Kuril islands. Plans on the west coast of Yetorofu jima :—Shana wan, Naibo wan. 2*s.*
417		Denmark. Grna deep. Plan added :—Esbjerg harbour.
2859		West Indies. Plans on the south coast of San Domingo. Plan added :—Barahona harbour.
551		South America, east coast. New plan :—Port San Antonio.
2284		Sumatra, west coast. New plans :—Sidoh bay, Riau and Lehong bays, Silugui bay.
935		Eastern archipelago. New plans :—Kamajang and Bonerate anchorages.
2466		Eastern archipelago. Anchorages in Flores, etc. New plan :—Sungi Menasa road.
2196		Celebes, southern part. Plan added :—Labuandata bay.
3468		China, north coast. Plans on the coast of Shantung. Plan added :—Wang-kia bay.
1022		Pacific, islands and anchorages in. New plan :—Macquarie island.

(*J. D. Potter, Agent.*)

Charts Cancelled.

No.		Cancelled by	No.
2598	Curves of equal magnetic variation, 1895.	Curves of equal magnetic variation	2598
2071	Youghal harbour.	New plan. Youghal harbour	2071
2361	Öland to Landsort.	New chart. Öland to Landsort	2361
2229	Entrance to Great and Little belts.	New chart. Little Belt	2116
2116	Great and Little belts.		
410	Port Cabañas. Plan on this sheet.	New plan. Port Cabañas	3513
1982*a*	Paraná river. Sheet 1.	New plan. River Paraná. Sheet 1	1982*a*
1982*b*	Paraná river. Sheet 2.	New plan. River Paraná. Sheet 2	1982*b*
1982*c*	Paraná river. Sheet 3.	New plan. River Paraná. From Paraná to Caalayti sand	3558
2512	Nanaimo harbour and Departure bay.	New plan. Approaches to Nanaimo harbour	2512
585	Nanoose harbour. Plan on this sheet.	New plan. Nanoose harbour and approach	3517
1109	Mersa Sheikh Barud. Plan on this sheet.	New plan. Sheik el Barghût	3492

No.	Cancelled by	No.
3283 Port Sual. Plan on this sheet.	New plan. Approaches to Port Sual and Cabalitian bay	3545
83 Channels between Misima Nada and Iyo Nada.	New chart. Gogo shima to Miyo shima, including Kuru shima Kaikyo	83
2405 Rubetsu bay. Plan on this chart.	New plans. Rubetsu wan. Furebetsu anchorage, etc.	3546
2405 Shana anchorage. Plan on this chart.	New plans. Shana wan. Naibo wan	3551
1268 Furebetsu anchorage. Plan on this sheet.	New Plans. Rubetsu wan. Furebetsu anchorage, etc.	3546
1268 Naibo harbour. Plan on this sheet.	New plans. Shana wan. Naibo wan	3551

(*J. D. Potter, Agent.*)

Charts that have received Important Corrections.

No. 1188, The World:—Coal and Telegraph chart. 1951, England, west coast:—Liverpool bay. 1975, England, east coast:—River Thames, Kentish Knock to the West Swin. 1607, England, east coast:—River Thames, North Foreland to the Nore. 2052, England, east coast:—Harwich approaches. 2397*a*, Scotland:—North and east coasts. 2397*b*, Scotland:—North and east coasts, with Orkneys and Shetlands. 117, Færoe islands. 2962, Arctic Russia:—North cape to Einsamkeit island. 2963, Siberia:—Gulf of Ob and gulf of Yenisei. 689, Spain:—Gibraltar harbour. 2608, France:—Approaches to Toulon. 1196, Mediterranean, Ægean sea:—Port of Volo. 1658, Ægean sea:—Suda bay and Khania. 2996, Black sea:—Karkinitskago bay. 1749, South America, east coast:—Monte Video to Buenos Aires, etc. 2908, Africa:—Port Natal entrance. 1696, Eastern archipelago:—Lombok to Flores. 2376, China, east coast:—Harbours in Formosa. 2695, China, north-east coast:—Sheet iii., Tung liu to Hankau. 2650, Russian Tartary:—Strait of Tartary, etc. 3033, Pacific ocean:—New Hebrides islands and New Caledonia.

Canada. **Department of Marine and Fisheries, Ottawa.**

River St. Lawrence. Scale 1:12,000 or 5·3 inches to a stat. mile. Chart 2. Longue Pointe to Varennes, surveyed by E. D. Lafleur, C.E., assisted by C. F. X. Chaloner, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1897. Chart 3, Ile à l'Aigle to Ile Marie, surveyed by E. D. Lafleur, C.E., assisted by C. F. X. Chaloner, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1897. Chart 5, Ile Bouchard to Ile St. Ours, surveyed by C. F. X. Chaloner, C.E., assisted by P. E. Parent, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1898. Chart 6, Ile St. Ours to Ile aux Foins, surveyed by C. F. X. Chaloner, C.E., assisted by P. E. Parent, C.E., R. Bickerdike, jun., C.E., A. Amos, C.E., 1898. Published under the orders of Honble. Raymond Préfontaine, Minister of Marine and Fisheries for Canada. Ottawa: Department of Marine and Fisheries, 1905. *Presented by the Canadian Hydrographical Department.*

These charts are the results of the surveys of the St. Lawrence by Messrs. Lafleur, Chaloner, Bickerdike, Amos, Parent, and Corvie made during the years 1897 and 1898. Many soundings are given, and the charts are well drawn and clearly printed in colours. They form part of a series now being published by the Department of Marines and Fisheries of Canada.

Chile. **Chilian Hydrographic Office.**

Chilian Hydrographic Charts. Nos.: 115, Islas Guaitecas; 124, Autofagasta, Caleta Hornos, Caleta Coloso. Valparaiso: Oficina Hidrográfica, 1905. *Presented by the Chilian Hydrographic Office.*

North Atlantic and Mediterranean. **Meteorological Office.**

Pilot Chart of the North Atlantic and Mediterranean for March, 1906. London: Meteorological Office, 1906. *Price* 6*d*. *Presented by the Meteorological Office.*

North Atlantic. **U.S. Hydrographic Office.**

Pilot Chart of the North Atlantic Ocean for February, 1906. Washington: U.S. Hydrographic Office, 1906. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Java. **Petrocokino.**

Thirty-eight photographs of Java, taken by A. Petrocokino, Esq. *Presented by A. Petrocokino, Esq.*

The views of temples, Buddhist carvings, and other antiquities are specially interesting. In addition to these, there are photographs of volcanoes and typical scenes in Java.

(1) Canalized river in Batavia; (2 and 3) View in the gardens, Buitenzorg; (4) Buitenzorg, Salak volcano in background; (5) Dutch official's house, Buitenzorg; (6) Racecourse with native stands, Bandoeng; (7) A ruined temple at Brambanan; (8) View from Tosari; (9) On the road to Magelang; (10) Native village near Garoet; (11) Gede volcano from Sindanglaja; (12) Tjipanas, near Garoet; (13) Hills of sulphur in crater of Papandajan; (14) Interior of crater of Bromo; (15) Volcano of Batok in crater of Tengger; (16) In Soerabaja; (17) Dutch house in Soerabaja; (18) Street, Soerabaja; (19) Mouth of the crater of Bromo; (20) Kawi volcano from Tosari; (21) Hindu village near Tosari; (22) The crater of Papandajan; (23) The Dasar, crater of the Tengger; (24) Near Leles, showing Goentoer volcano; (25) Lake of Leles; (26) Dutch fort, Djokjakarta; (27) In the Kraton, Djokjakarta; (28 and 29) View from the Boro Boedor; (30) View through archway of Boro Boedor; (31) Domes on Boro Boedor; (32) Corner of terrace of Boro Boedor; (33) Bas reliefs of Boro Boedor; (34) Corner of basement of temple of Boro Boedor; (35) Tjandi Brambanan; (36) One of the figures at the ruined temple of Tjandi Sewoe; (37) View of ruined temple of Tjandi Sewoe; (38) Statue of Buddha in temple of Mendoet, near Djokjakarta.

Nigeria. **Howard.**

Fifty-five photographs of Nigeria, taken by Captain C. A. M. Howard (West India Regiment). *Presented by Captain C. A. M. Howard.*

These photographs were taken by Captain Howard between November, 1904, and September, 1905. They represent scenes on the Niger between the Forcados river mouth and the French frontier. The following are the titles:—

(1) Government wharf, Burutu; (2) Typical native village on the Forcados river; (3) Digali station; (4) Messrs. Holt's screw steam lighter *Trader* ashore; (5) Niger Company's s.w. *Kaduna;* (6) Mureji village; (7) Government rest-hulk *Africa* at Mureji; (8) Typical river-side village between Mureji and Jebba; (9) Approaching Ogudu; (10) Native canoes at Ogudu; (11) The landing-place at Jebba; (12) View on approaching Jebba; (13) The Niger above the Kissa gorge; (14) General view of Fort Goldie; (15) View down the Niger from Fort Goldie landing-place; (16) View across the river from Fort Goldie to Badjibo; (17) A typical scene on the departure of a Government officer, Fort Goldie; (18) The landing-place at Leaba West; (19) View down-stream from Leaba West; (20) Leaba East; (21) Approaching Wuru; (22) View down-stream from Wuru Portage; (23) View above the Wuru rapids; (24) Canoes ascending the Wuru rapids; (25) The Wuru rapids; (26) The Niger near Potashi; (27) View of the Niger; (28) Leaving the village of Longungere; (29 and 30) Unloading at the Garafini portage; (31) View down the Niger from Garafini; (32) The big bend on the Malali rapids; (53) The river above the Malali rapids; (34) A street scene in Bussa; (35) The market-place in Bussa; (36) The new cantonment, Bussa; (37) The doctor's house, Bussa; (38) The Niger at Ganakaisi; (39) Warra landing-place; (40) Canoes leaving Warra; (41) Native huts on Newmu island; (42) View up the Western river from Sagonu; (43) The Oku rapids; (44) Canoes ascending the Western river; (45) Canoe wrecked in Western river; (46) Gingima river; (47) Yelwa; (48) View in Yelwa market-place; (49) Traders stock caravans at Yelwa; (50) View from the old Government cantonments, Yelwa; (51) Inegu landing-place; (52) Sorogo landing-place; (53) View looking towards Illo; (54) The guard-room and entrance, Illo Fort; (55) The district officer's house at Illo Fort.

Vegetation Types. **Karsten and Schenck.**

Vegetationsbilder, herausgegeben von Dr. G. Karsten und Dr. H. Schenck. Dritte Reihe, Heft 6. Vegetationsbilder aus Kleinasien. Von Dr. Emerich Zederbauer. Jena: Gustav Fischer, 1906.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.